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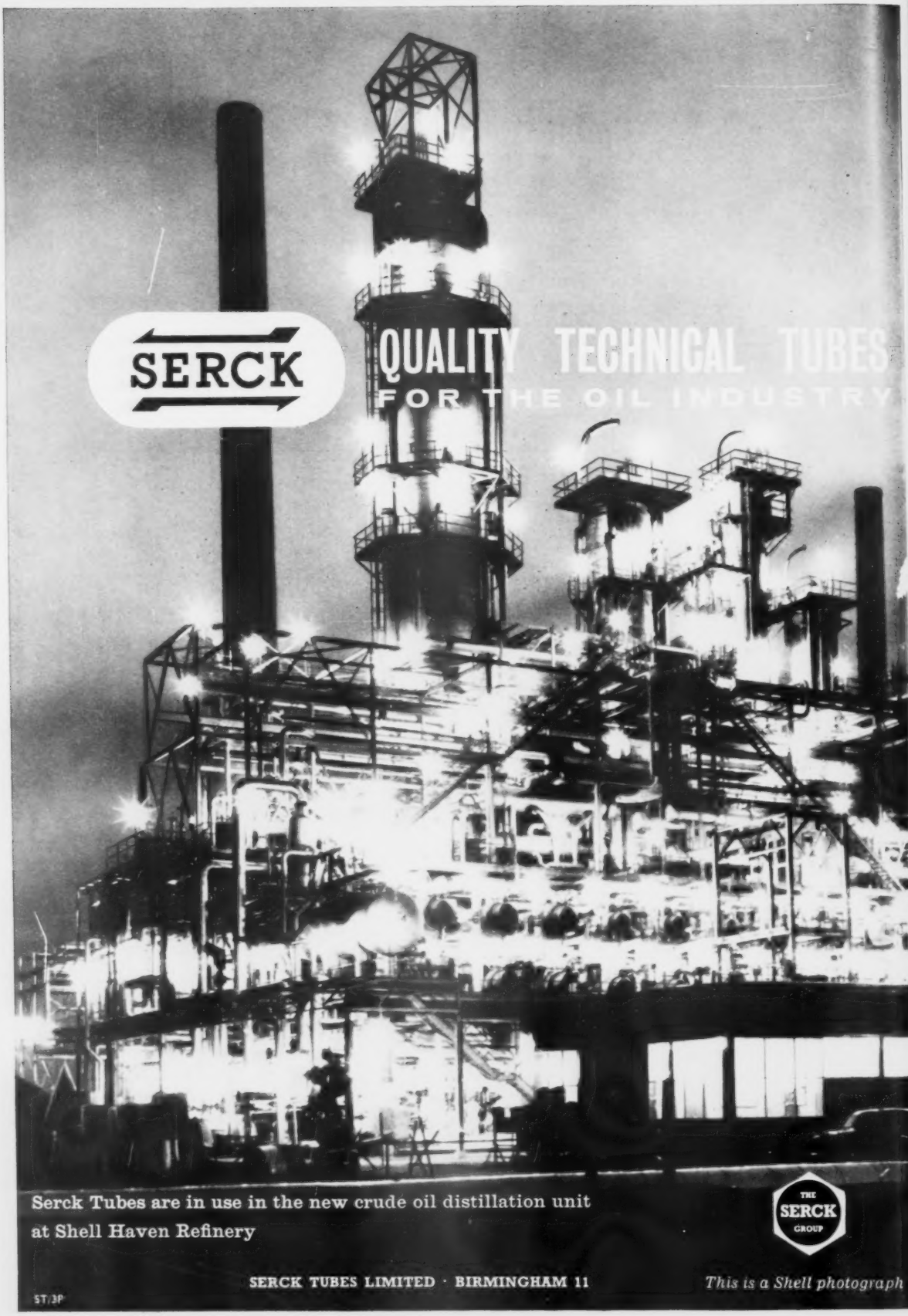

Serck Tubes are in use in the new crude oil distillation unit at Shell Haven Refinery

THE SERCK GROUP

SERCK TUBES LIMITED · BIRMINGHAM 11

This is a Shell photograph

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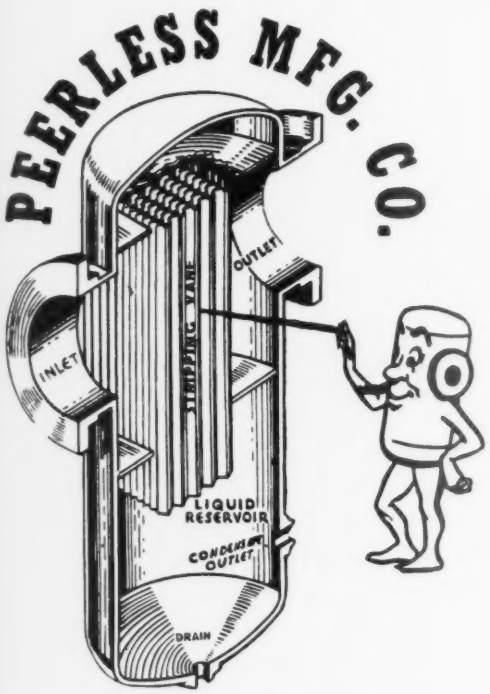

The drawing above shows the arrangement of the vanes in the Separator. The mist extractor combines the forces of impingement, centrifugal motion and surface tension to obtain its high efficiency. The path of the gas through the unit is constantly bending, causing semi-violent turbulence and rolling of the gas against the walls of the vane. Impingement and centrifugal force combine to contact the droplets with the vanes, where they coalesce, and surface tension causes them to adhere to the vane surface. Gravity and the impact of the gas stream then drive the droplets into the pockets, where they roll down the vanes and out of the gas stream.

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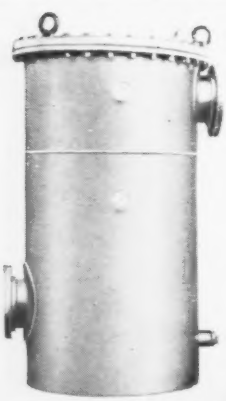

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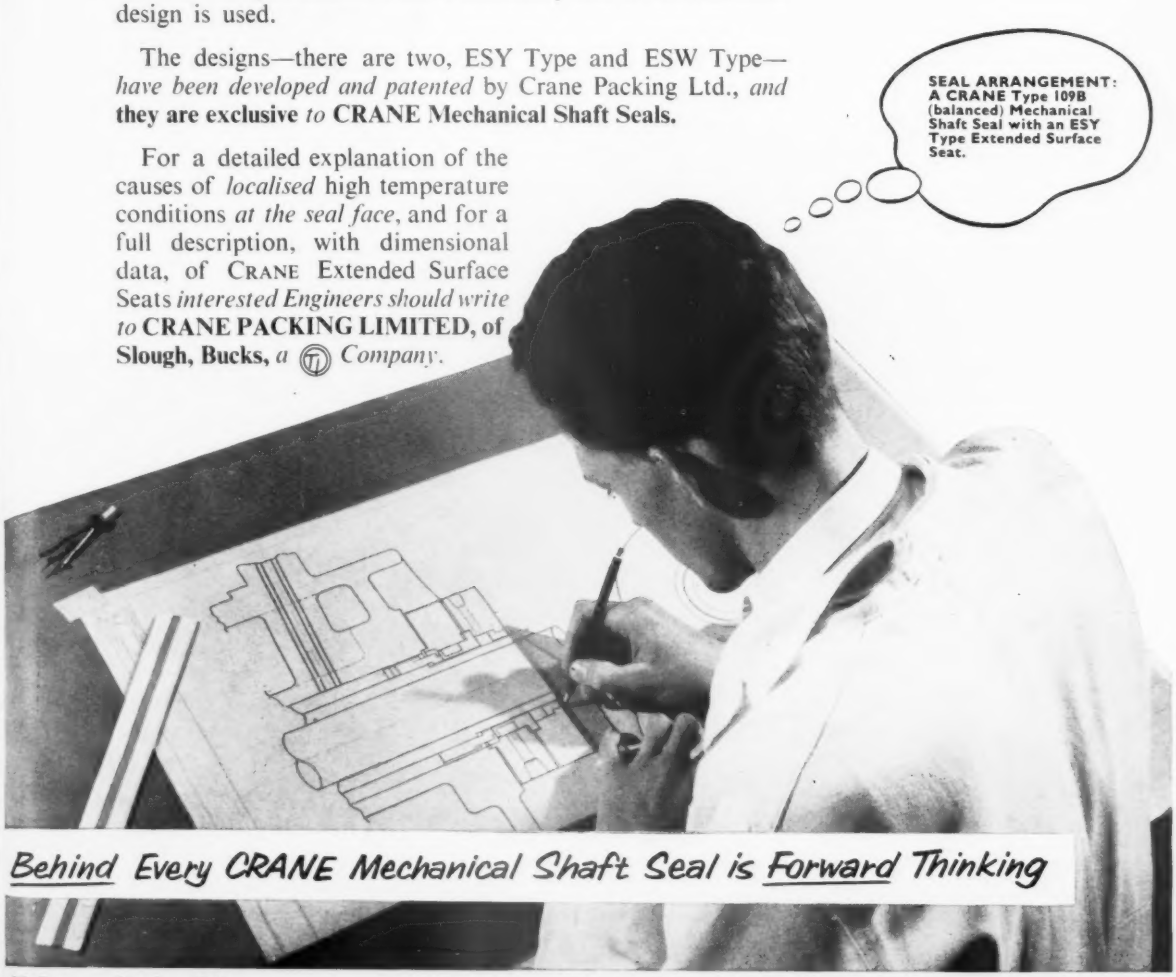

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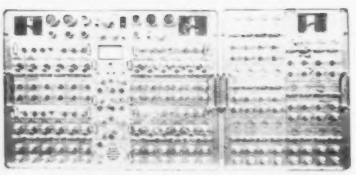
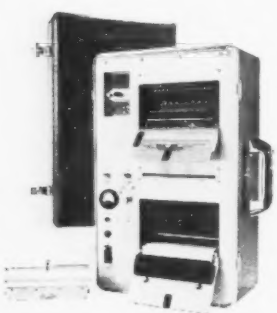


PT-100 TRANSISTORIZED SEISMIC AMPLIFIER with radic improved signal-handling capabilities to eliminate distortion

The PT-100 combines obvious transistor design advantages—low power drain, light we compact size—with performance improvements allowed only by solid state compone It is a significantly new seismic amplifier.

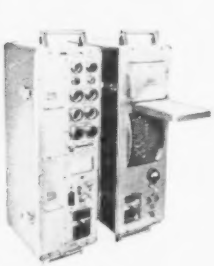
Use of a light-sensitive photocell as an AGC element provides signal control n before possible. This amplifier will not overload in any area. Transistor circuits elim maintenance problems such as are inherent with vacuum tube designs. Low-cut filte the geophone line help insure negligible overall distortion. Operator-oriented m controls provide separate record and playback adjustments for both "early" and "l amplifier gain.

Significantly improved results are now possible in refraction, reflection and frequency recording with the all new PT-100.



TRO-6 TRIPLE RECORDING OSCILLOGRAPH provides multi display but needs only one galvo block

From SIE comes the first multiple display oscillograph requiring only one galvo b Choose variable density, variable area, conventional wiggle, variable-density-and-w superimposed, or variable-area-and-wiggle superimposed. Timing lines may be from fl tubes or timing motor. Flashers, driven from self-contained circuitry, can be controlle an internal fork or from a tape playback signal. Record speed is accurate and repea with "locked-in" drive. A synchronous motor—completely free from "camera hash driven from a built-in transistorized amplifier with a 400 cps drift-free, non-position-sen fork. Answer all your oscillograph recording needs with this one camera.



PMR-20 PORTABLE FM MAGNETIC RECORDING SYSTEM high-fidelity field records

Two compact units contain a complete 24 trace high-fidelity FM magnetic recording sy the PMR-20. The MR-20 Transport Unit houses the recording drum, drive system recording heads. The MU-20 Master Unit contains the modulators, demodulators auxiliary electronics. Each unit has its own built-in transistorized power supply. PM FM recording provides an improved signal-to-noise ratio and lower distortion as com to other recording systems. A frequency response of from 1 to 500 cps coupled frequency-modulation recording provides true high fidelity performance. Join the users of more than 50 PMR-20 systems already in the field.

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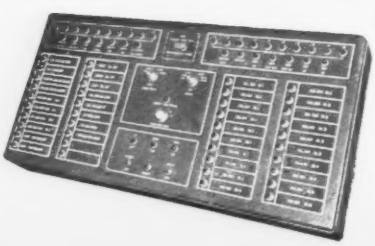


SIEMARC DISPATCH CONSOLE IN PHILLIPS VENEZUE SYSTEM designed to permit unattended operation of offsh platform

Automatic, one-man control of a twenty-well lease from this single console seventy away is possible by dependable, solid-state SIE equipment. Scanning, display and log of alarms and data is included with shutdown control for wellhead and processing e ment. Modular construction of components and sub-assemblies allows system flex at minimum cost. All control, alarm and data signals are handled in error-safe digital Complete fail-safe design and continuous monitoring assure installation safety.

products
TIME AND MONEY

PIPELINE CONTROL

ISPATCHERS CONSOLE used by Cherokee Pipe Line Company for utomatic control of liquid line

EMARC Supervisory Systems provide automatic monitoring and remote control for many dustrial operations and processes including the petroleum installation pictured. Measuring, ta gathering, telemetering, logging, display, indicating and computing are all integrated in e system. Both solid-state and relay components are used as dictated by proper engineering sign. Transistors and semiconductor diodes are utilized in all high-speed switching and logic rcuits including encoders, decoders, analog-to-digital converters, deviation detectors and gnetic drum circuitry. Separate electric logging typewriters record data and alarms.

OWER LEVEL CONTROLLER used by Shell Pipe Line Co. for maxi-um pumping station operating economy

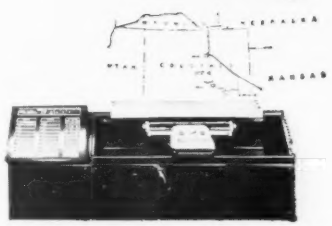
mpletely unattended operation of a multi-unit pumping station is possible with a Power vel Controller now in use by Shell Pipe Line Co. The unit accepts signals from flow and essure pickups and makes logic decisions to bring proper combinations of pump units on off stream automatically. It may be connected to the supervisory control system to permit et of power levels from a central office dispatching console.

OMPRESSOR STATION CONTROL CONSOLE including complete gine control equipment for automatic station operation and safety

r gas transmission automation, the basic SIEMARC system can be coupled with Log-Alarm utdown and Engine Control-Sequence units. Building block design throughout allows to fit your needs exactly.

SPATCH PANEL used by Colorado Interstate Gas Company

he Colorado Interstate Gas Company installation shown, dispatchers transmit only desired charge pressure settings; automation at each compressor station responds by maintaining selected value for optimum station economy. If communication links fail, local automation erates without interruption. Log-Alarm units insure station safety. Dispatchers are alerted y when trouble occurs.



The equipment shown here—and all the rest from SIE—illustrates the company's fundamental design concept: electronic systems and products to provide you with fastest payout and lowest overall operating expenses.

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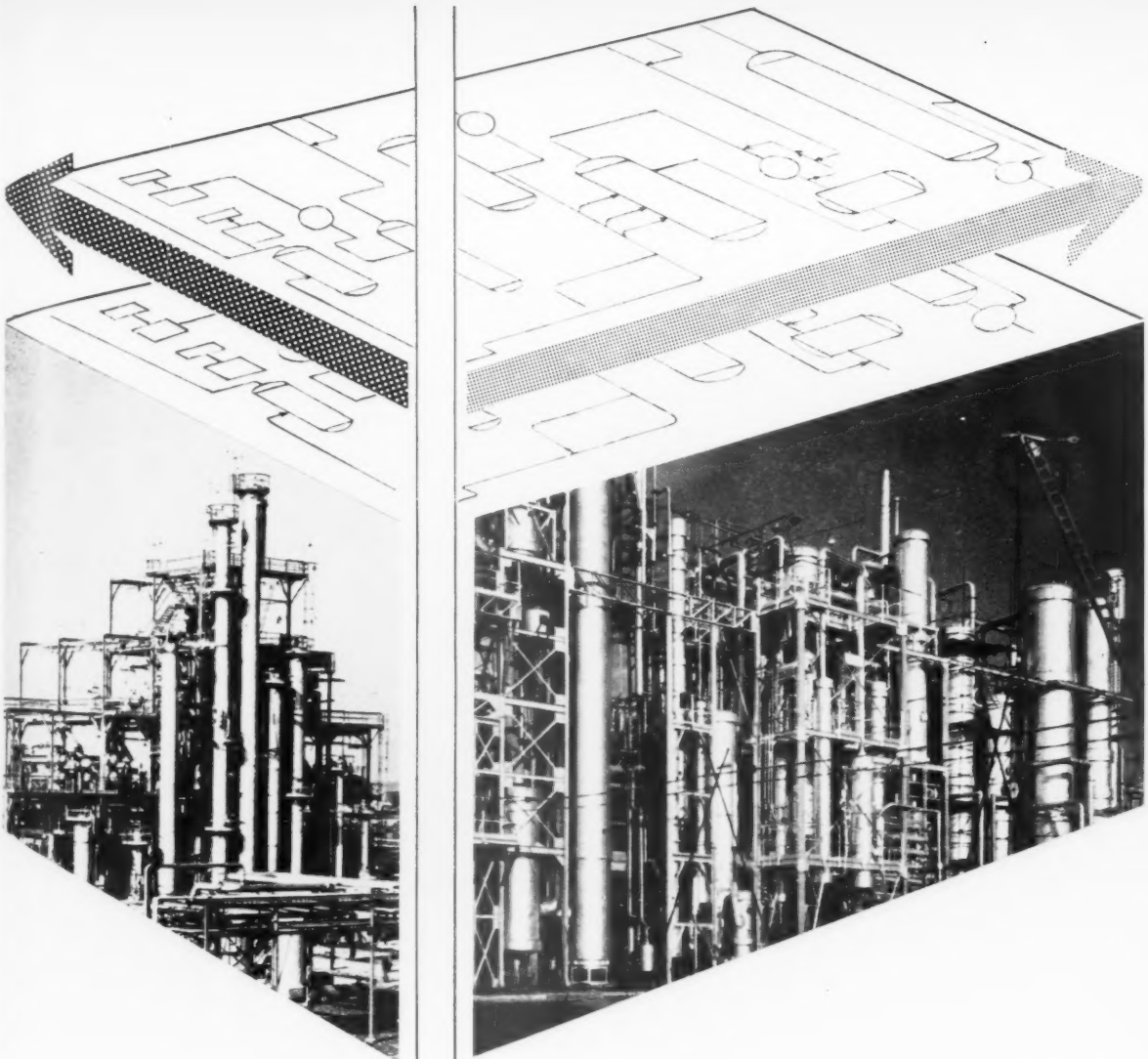

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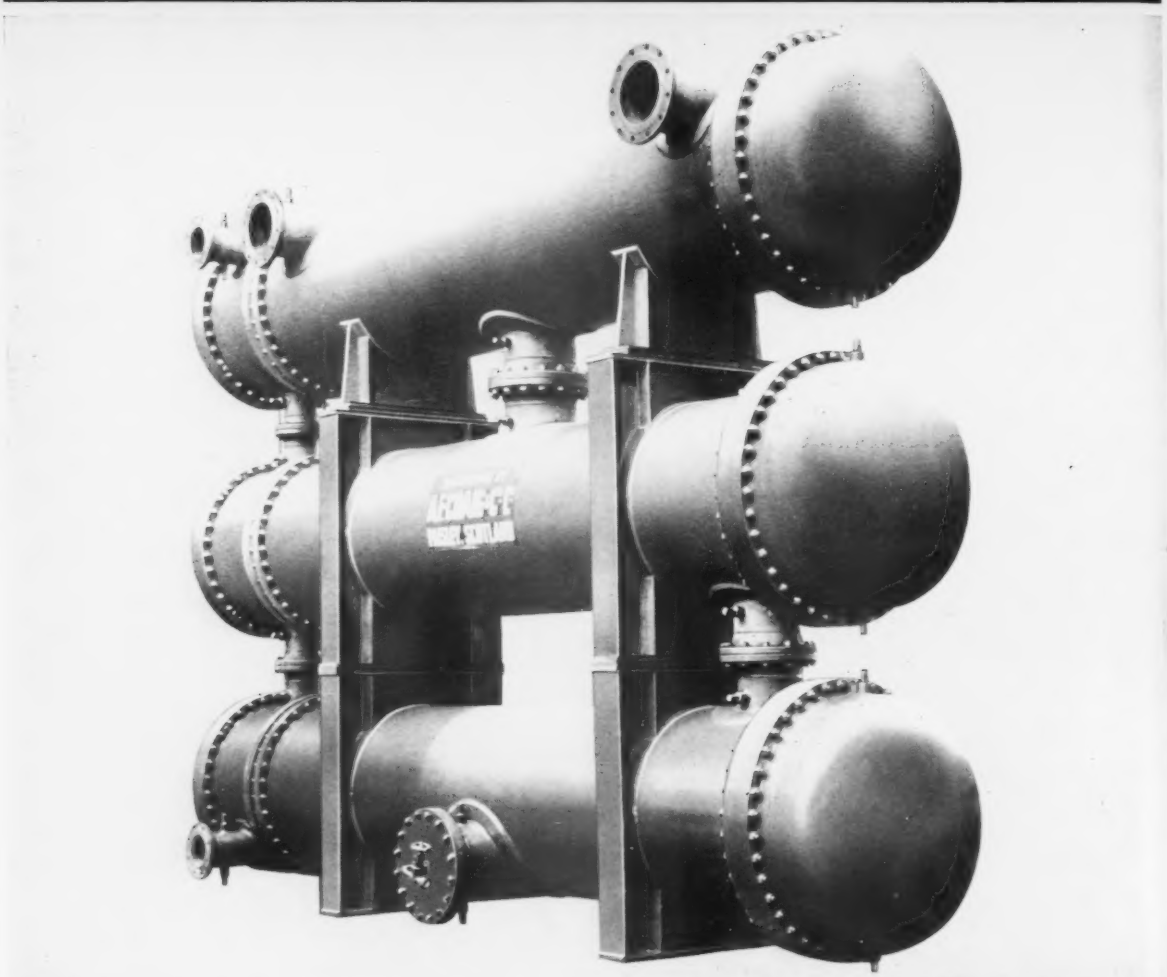
Illustration shows 3-Shell Exchanger, a 1st stage After-cooler of 7600 sq. ft. total surface for service in an Ethylene Process Unit.



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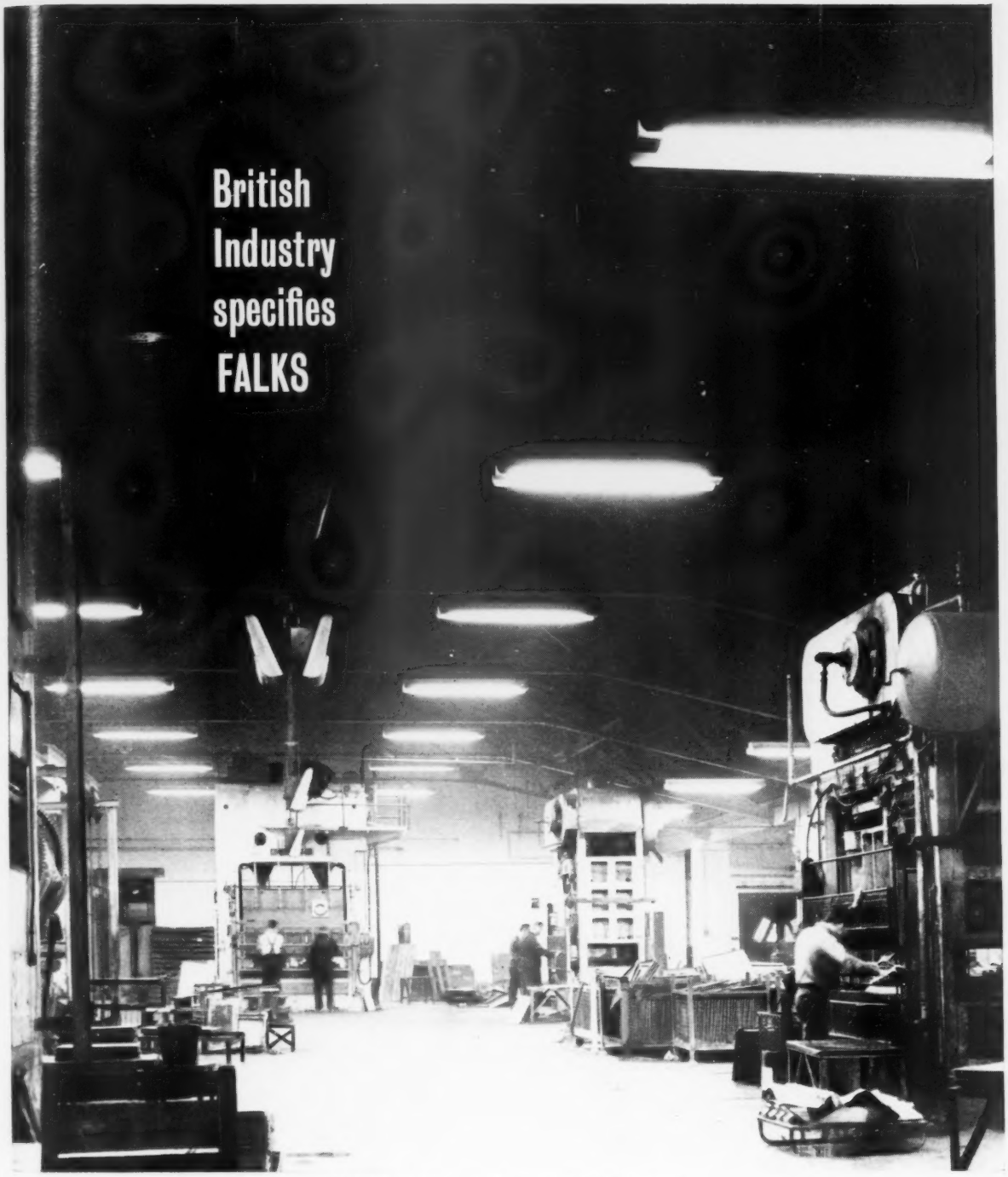

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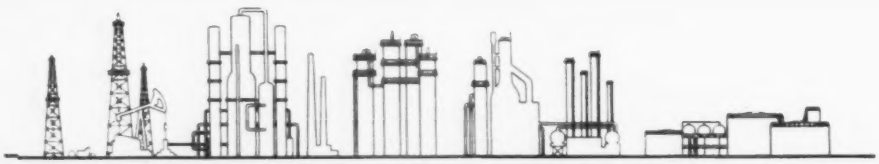

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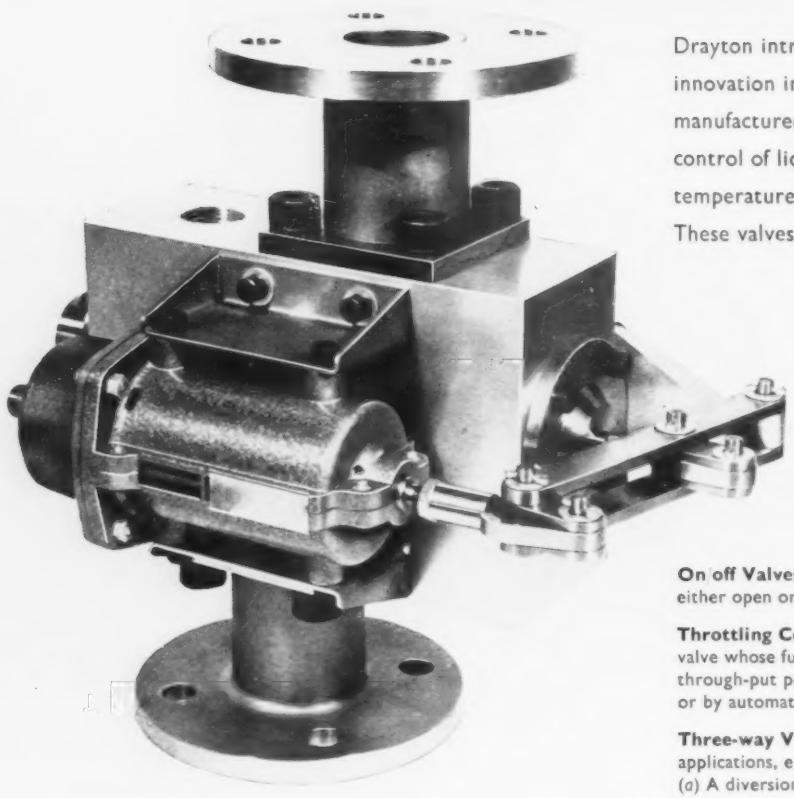

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Drayton introduce a complete innovation in valve design—the X range manufactured specifically for the control of liquids and gases at very high temperatures and/or pressures.
These valves are classified as follows:

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Throttling Control Valves: These include any valve whose function it is to modulate its through-put progressively, either by manual or by automatic operation.

Three-way Valves: These cater for various applications, e.g.:
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(*b*) A mixing valve which has two alternative supplies and a common outlet.

Specials: Built-to-order valves where the medium under control calls for specialised units outside the scope of the 3 types above.

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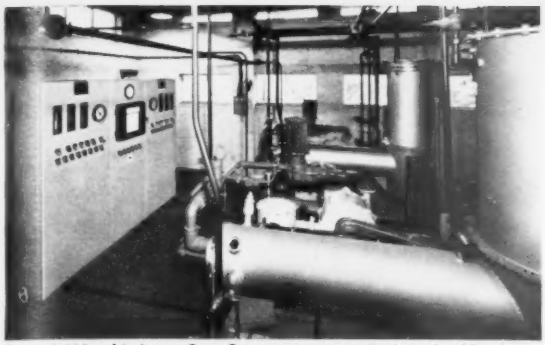


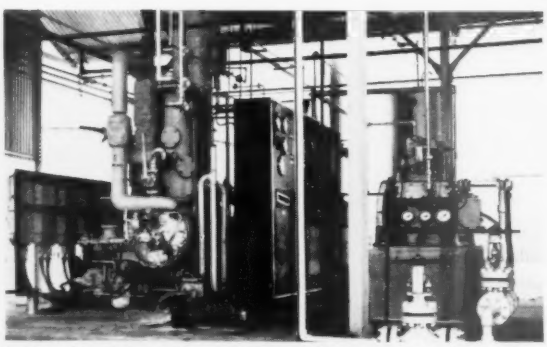
Twin 2,000 c.f.h Inert Gas Generators installed at the Maydown Works of Messrs. Carbide Industries Limited. The inert gas, which is used for blanketing operations, is continuously monitored by a gas analyser controller to ensure that it is of a consistent high quality.

Inert Gas Generators

Holmes Inert Gas Generators produce inert gas by the controlled combustion of gaseous or liquid fuels. The analysis of the gas produced can be varied over a wide range to meet specific requirements—for very close control, continuous gas analyser control units can be fitted. The generators have variable outputs down to 25 per cent of the rated capacity.

Standard generators are available for capacities up to 60,000 s.c.f.h.; for applications where larger capacities are required special units can be designed.

Controlled Atmosphere Generators



A 530 c.f.h. Holmes-Kemp Nitrogen Generator installed at the Mina al Ahmadi Refinery of the Kuwait Oil Company Limited. This generator produces a high purity nitrogen (99.8 %) which is used for general purging purposes on the Platformer Unit.

GAS	TYPE	NITROGEN + RARE GASES	CARBON DIOXIDE (CO_2)	OXYGEN (O_2)	COMBUSTIBLES (CO + H_2)
INERT GAS	Standard	88-84 %	12-16 %	0·5 %	0·015 %
	Standard	88-84 %	12-16 %	0·02 %	0·5 %
	Special	88-84 %	12-16 %	0·5 %	5 p.p.m.
	Special	88-84 %	12-16 %	5 p.p.m.	0·5 %
	Special	88-84 %	12-16 %	5 p.p.m.	5 p.p.m.
NITROGEN GAS	Standard	99·4 %	0·1 %	0·5 %	0·015 %
	Standard	99·4 %	0·1 %	0·02 %	0.5 %
	Special	99·5 %	20 p.p.m.	0·5 %	0·015%
HIGH PURITY NITROGEN GAS	Special	99·99 %	20 p.p.m.	5 p.p.m.	5 p.p.m.
NITROGEN WITH HYDROGEN	Standard	90 %	0·1 %	Nil	5 % - 5 %
	Standard	90 %	0·1 %	Nil	0·3% - 10%

Nitrogen Generators

Holmes-Kemp Nitrogen Generators are basically inert gas generators with the addition of a carbon dioxide removal unit. The stripping medium is monoethanolamine solution which is continuously regenerated using the heat from the combustion of the fuel. Variable outputs down to 50 per cent of the rated capacity are possible. Standard generators are available for capacities up to 20,000 s.c.f.h.

Carbon Dioxide Generators

The carbon dioxide removed in the Holmes-Kemp Nitrogen Generator can be processed to give pure CO_2. Package units up to 375 lb./hr. of CO_2 are available.

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To reduce the impurity content of the atmosphere gases produced in our generators to the figures quoted in the table opposite, we can offer the following purification units:

Catalytic conversion Copper oxide reactors	Combustibles (CO + H_2)
Catalytic conversion Chemical reaction	Oxygen
Iron oxide Chemical absorption	Hydrogen sulphide
Chemical reaction	Oxides of sulphur
Chemical reaction Catalytic reduction	Oxides of nitrogen

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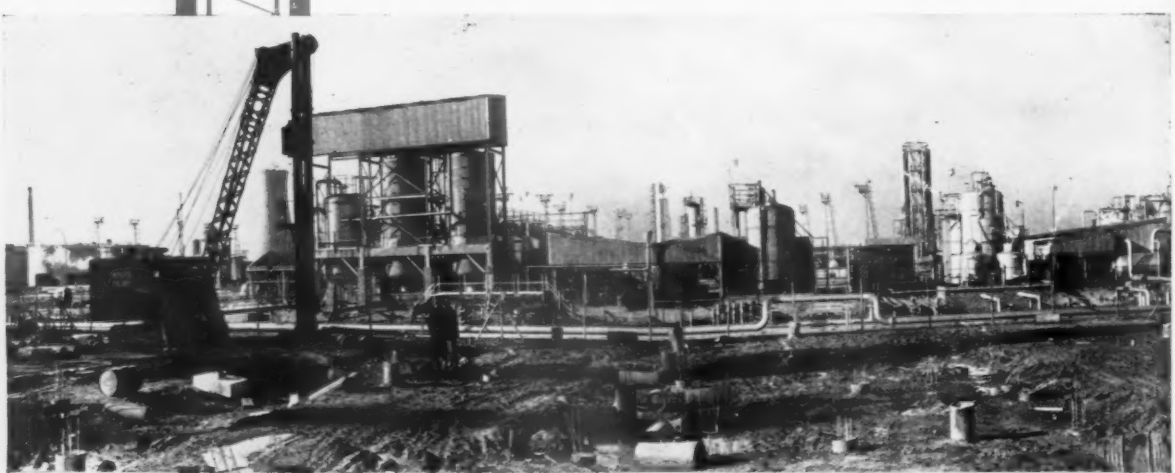
refinery foundations

This mobile piling machine is driving 14½ in. dia. West's Shell Piles to support the foundations of the Predistillation Plant at the B.P. Refinery on the Isle of Grain. Since this important site was first developed more than 14,500 West's Shell Piles have been driven to support many different items of refinery plant and equipment.

West's Shell Piling System, which combines a pre-cast sectional outer shell, driven to a firm "set" in the load-bearing stratum, with a concrete core cast after driving is completed, and reinforced as required, has also been used for the foundations of petroleum and allied plant at refineries and storage installations in various parts of the country, including Fawley, Thames Haven, Belvedere, King's Lynn, Partington, Grangemouth and Avonmouth.



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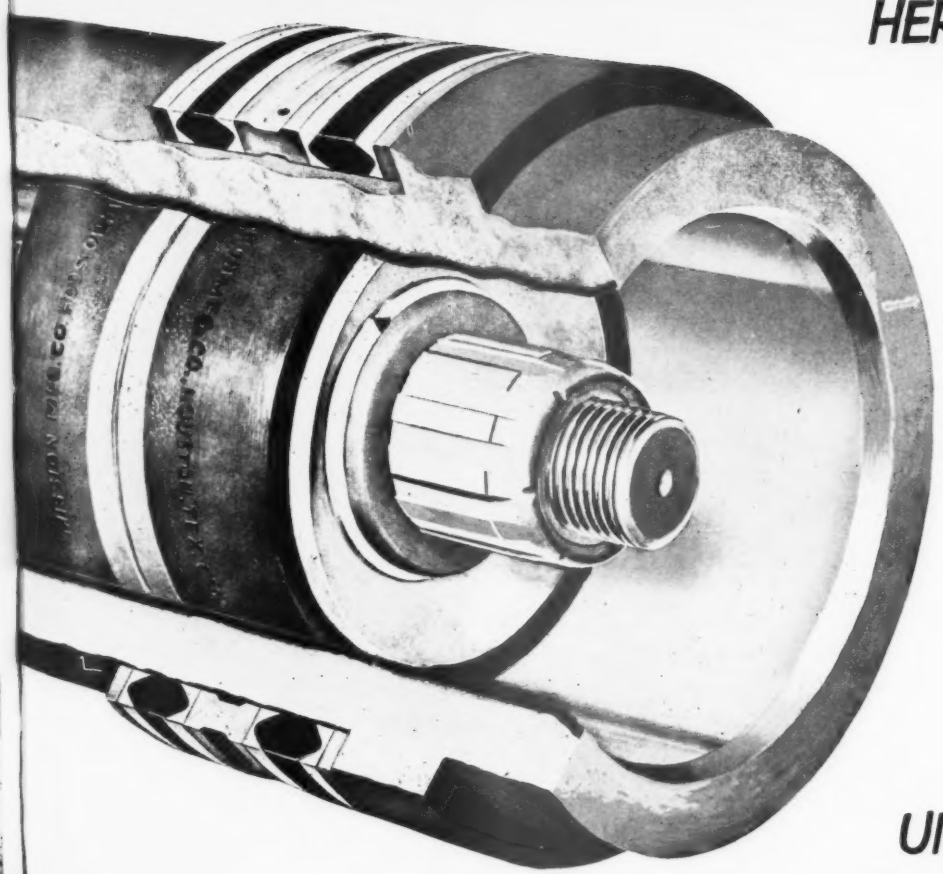

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AND MISSION LINER PACKING

MAKE AN UNBEATABLE COMBINATION

MISSION PISTONS last longer due to their specially compounded rubber developed through research, and their proven design. They cost less to renew because piston rubbers can be replaced without changing the body.

Forged steel piston bodies feature an accurately machined, induction-hardened, Missionized flange that gives long life and extends both piston rubber and liner life.

Liners last longer when Mission Pistons are used because the fabric back of piston rubbers reduces the danger of serious scoring or fluid cutting.

MISSION LINERS keep down piston and liner packing costs as well as liner costs.

For normal to heavy-duty service, Mission Super-Service® Liners are recommended. They feature an accurate, uniformly induction-hardened bore that keeps down piston costs as well as liner costs.

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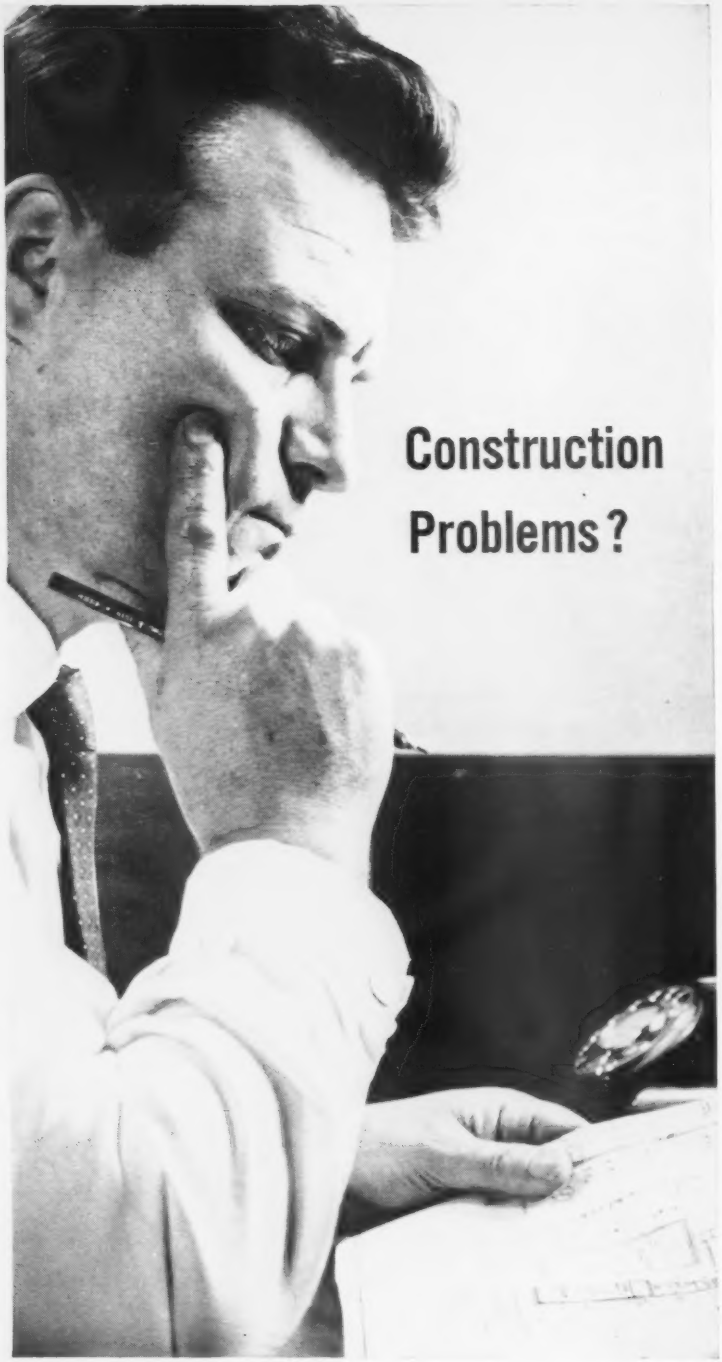

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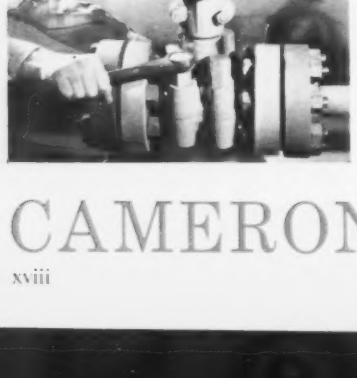

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Modern Advances in Geophysics

By A. A. FITCH†

The second and third in the series of papers presented at the symposium entitled "Why Are Oil Reserves Continually Growing" held on 23 June by the Exploration and Production Group of the Institute are published in this issue.

When a geophysicist is asked to speak on "Why Are Oil Reserves Continually Growing?", he needs to look at the process of oil finding, if for no other reason than to see what it is he must answer for. The work of a geophysicist is not closely tied to the statistics of reserves, so that this paper cannot be cast in the form of charts or statistics; the geophysical contribution is part of a team effort of exploration. Although technical journals classify some new oilfields as geological discovery, some as geophysical discovery, and some as wildcat, this distinction can rarely be made in the modern day.

Oil reserves continue to grow because the boards of directors of oil companies decide that they should grow. In the case of some national enterprises, the policy-making body is different, but similar decisions are taken. The managements of the oil companies or these other bodies are able to implement the decisions taken by the boards of directors, and they do so by delegating the technical execution of the programme to geologists and geophysicists. Since the geophysicist has no way of detecting oil from the surface, he can use only an indirect approach, the approach of determining the structure. His efforts, therefore, must be directed by geological considerations, and the full appreciation of results is possible only in the terms of known geology. This relationship is familiar enough to those who work in oil exploration, and, in the present context, it serves to group the modern advances in geophysics into those which have their greatest impact at management level, those which have their greatest impact on the geologist, and those which, by improving the quality of their work, are of most concern to geophysicists.

Under each of these three headings, there follows a few examples to illustrate the trends in modern geophysical practice.

Management Considerations

Management is greatly concerned with money; with the cost of operations which it plans and controls. It may be complained that this was not the kind of advance which was envisaged by the title "Advances in Geophysics", but it is true that the costs of geophysical work do advance, in general, whether considered as costs per month, or costs per unit of traverse for a particular method. This is partly an aspect of the universal increase in prices in the present day, and partly it is the result of tackling ever more difficult areas. Improved efficiency will offset these increases to some extent, but we are still left with a general increase. Nevertheless there are movements, which result from some modern introductions, against the general upward trend of prices. Among those which must be mentioned are the weight-dropping methods in seismic work and other methods, such as *Vibroseis*,* using a shaped pulse as the input of energy to the ground which remove from the cost of seismic surveys the cost of drilling shot holes and the cost of explosives, and substitute expenditure on more sophisticated equipment and more sophisticated procedures. The result is an absolute saving in cost.

Another line of approach is seen in a few special circumstances where cost savings can be effected in the planning of exploration effort. One example is that of some sedimentary basins which are known on land only as a narrow selvage along the coast, the greater part of the basin being concealed at sea. Quite often, it is found that the cheapest initial exploration of such a coastal strip is a marine gravity or seismic traverse, parallel to the shore and a short distance from it. This reveals the major structural features more quickly and generally more cheaply than any land-based operation.

Management is concerned also with the pace at which

†Seismograph Service Ltd.

*A trademark of Continental Oil Company.

geophysical work can be accomplished. It must have known rates of progress in order to evolve suitable plans; and this planning becomes more and more important as the concession terms become constantly more demanding and more rigid, often setting exact dates for the commencement of geophysical work and of drilling. It is true to say that an all-round improvement has been achieved in the time which it takes to put geophysical parties in the field, and also in the pace which can be achieved when the party is operating. Most is achieved by painstaking attention to details of the survey, thereby eliminating factors which delay the particular operation.

There are, however, a few startling advances in the pace of geophysical work, of which the use of the airborne magnetometer, gravity measurements from a moving ship, and, in particular types of seismic survey, the use of helicopters to speed the men and equipment along the line of traverse are examples. And all of these have been adopted to a greater or lesser extent by the industry.

Advances have also been made in another direction—the extension of the working season throughout the year in regions long thought to be closed for a part of the year. Crews, for example, begin to work throughout the Sahara summer and through the worst rains in India and West Africa, while in high latitudes geophysical work is being conducted under very unpleasant cold conditions. Such advances, it is true, are helped by improved food and quarters, and improved care of the men generally. In spite of improvements in the physical surroundings, such things can only be accomplished by outstanding effort on the part of the men who are doing the work.

During my own days in the Royal School of Mines I recall a geological comparison, the then Geological Survey of the Gold Coast. The geologists spent, in those days, about 6 months on foot in the field and 6 months in London. That has progressively changed over the years until now they spend all their time in the country to which they are assigned. The changes in geophysical crews have been similar. The extensions to the working season help management to meet the deadlines set by concession terms.

In making plans for exploration, management is led to operate in ever more difficult areas. The difficulties may be technical, as in some areas for seismic reflection, or they may be the difficulties of reaching or moving about in a particular terrain. Each year the geophysicist finds himself tackling bigger sand dunes, wetter swamps, and less and less attractive parts of the oceans. A few years ago I found myself working at sea, and the only hope and comfort derived from charts was this inscription, "These waters are dangerous for mariners".

Summarizing the way the geophysical advance must look to managements, it can be said that the work goes faster with better performance everywhere, but that it generally costs more.

Benefits to the Geologist

In turning to those advances which assist in the daily work of the geologist, I must again be selective. In the interpretation of gravity results, there are such things as the simple analogue devices of an optical kind which enable the geologist or the geophysicist to try out a particular geological hypothesis to see whether any of their ideas are in accord with the gravity measurements. This does not afford conclusive proof of a gravity hypothesis, but it does enable certain hypotheses to be discarded. The procedure is simple. It consists of drawing a hypothetical cross-section to a particular scale, shading it with tints which are related to the specific gravity of the rocks in the section. The equipment then yields the hypothetical gravity values which would have been observed on such a terrain.

Perhaps the advance most appreciated by the geologist is the advent of the instrumentally produced seismic cross-section, which presents the observed data direct to the geologist and permits him to make his own interpretations or to follow in detail the efforts of the geophysicists to interpret the results which are before him. This is a great advance on earlier days when a seismic recording was a lot of wiggly lines. The first step in interpretation was to appoint a seismic computer who would exercise his judgment as to what constituted a valid reflection and what did not, and the result was that the geologist was presented with a cross-section which had this separate judgment interposed between him and the observations. The original result was never before him, and even if it had been, it would not have been readily comprehended. In the field of well logging, it is now possible to log almost every parameter that one can think of. This has elaborated greatly the setting out of a logging programme for a well. It has complicated also the interpretation of the many combinations of logs with which the sub-surface geologist can be confronted. By using the proper combination of logs for the problem, a great deal can be learned of the formation characteristics and their fluid content. There are also some matters, more of interest to the engineer than the geologist, which can be worked on with some accuracy. An example of this is the cement bond log, which gives a fair measure of the degree of bonding between the casing and the cement.

It is from one of the newer logging systems, the velocity log, that it is possible to produce synthetic seismic records. This production of synthetic records represents an attempt to relate the sub-surface information in wells with the results from seismic surveys in the surrounding territory. There is a theoretical possibility, not yet achieved, by which it would be possible to take an ordinary seismic trace as determined by regular seismic survey and, by suitable processing, convert it into something very like a velocity log. If that could be achieved with perfection, it would be a method of working from the well that was known into the unknown territory surrounding it, through the medium of such artificially made velocity logs.

The problems of achieving this are as yet unsolved, so that the method which has been adopted is a rather makeshift process, though still a valuable one. This is not to convert seismic trace to velocity log, but to convert velocity log into a synthetic seismic trace. The chain of reasoning is now from the velocity log of the well and its known lithology and characteristics to a synthetic seismic trace, and from that by inference into observed seismic traces from areas nearby.

In trying to summarize the impact of these few advances on the geologist, one could say that it means that there is now much more common ground between the geologist and the geophysicist than before. In the earlier days of geophysics, one could read geological and geophysical reports on the same territory and find scarcely anything in common, the two workers seeming to be dealing with a different earth. In the present day such reports are easier to reconcile—a true advance.

Geophysical Progress

Finally, those advances which lead to improvement in

the quality of geophysical work. By their nature they are much more evident to the geophysicist than to the geologist, although if one is insistent enough and can make observations by the two techniques and present the results side by side, then the geologist can be convinced. The justification, in fact, for persisting with the items which I shall mention, can only be that they will demonstrate that they can put more structural information before the geologist, or that they can demonstrate to the management that they are faster and better and cheaper. The ones shown here are all from the seismic field. The first step of recent years was the introduction of a reproducible recording, either on magnetic tape or on a variable area record. A few years ago, if one made a seismic observation then one had to set the controls on the recording instruments, and if the results were not good the experiment was repeated. In other words, the progress of seismic survey in the field was delayed by the need to repeat many of the observations. Even if usable results were obtained, it would be realised at the end of the survey, perhaps, that in some sections much better results could have been obtained with different instrumental settings. So the first use of these reproducible recordings was to take them to the playback office, and there, in a more leisurely atmosphere, to repeat the experiments on several instrumental settings and so acquire the best structure information which could be obtained from a particular field set-up.

The second result which followed from this ability to reproduce in the office the signals given by the geophones during the field work was that it was possible to "stack" the results. "Stacking" means simply the addition of the successive recordings one to the other, these successive recordings all being so arranged that the reflections from the several horizons fall at the same places on the "stacked" record. Such "stacking" is based on the concept that if one is getting reflections from the same point on the reflector, they will, after any necessary corrections, appear at the same time; while, as the parameters of the experiment are changed a little, the pattern of noise which tends to obscure reflection signals is also changed. As these things are added together, they follow different laws—the strength of the reflection signal goes up in a linear way whereas the noise adds up in a square root law, the net result being that the more that is added, the clearer the reflection becomes. That is always an exciting thing to watch, even if the starting point is a group of records where the reflection is clearly seen amongst the noise; but it is very impressive indeed when the initial records show no visible reflections, when the level of the reflection signal is hidden by the level of the noise.

Both of these lines have advanced on a refinement of the recording end of the seismic procedure. We now have more on our records and cross-sections for a given procedure in the field. But at this stage we are still using what is really an inefficient method of creating the seismic wave which we set out to study. The seismologist can use only a very restricted range of earth movement in his study. If a large quantity of energy is put into the ground by use of explosives or some such method, then a considerable proportion of this will go to distortion of rocks and crushing of rocks, blowing them high in the air and doing things which have no interest to the seismologist. None of those happenings generates any seismic waves going into the ground, because the seismic pulse is an elastic pulse in which, by definition, every particle which is displaced must return to the place from which it started.

The seismologist has a still further restriction on the type of energy which he can use. Energy of high frequency is no use to him, because although it can be put into the ground as a truly elastic pulse, it attenuates very quickly as it travels through the earth, and contributes little or nothing to the return signals which are to be recorded.

Now to look at two improvements in this process of putting the seismic signal into the ground, and at some of the advantages which accrue from the change.

The first one to be used widely was most simple in principle—it was weight-dropping. If a weight is dropped on to the ground there is very little crushing of rocks, a slight indentation in the ground perhaps, but very little diversion of energy to non-seismic processes. The frequencies generated are not under control, and consequently there is loss of energy due to the generation of unwanted frequencies on impact. Nevertheless, by that one stage a saving in the generation of energy has been effected.

At this stage also the "stacking", which was mentioned earlier, becomes much cheaper and much more readily acceptable to the industry. Going back to conventional seismic work using explosives, it will be seen that every time one needs to get a record to add to one's collection, then it is necessary to go through the process of drilling shot-holes, firing explosives, and making a full expenditure of the time and money necessary for a seismic observation. If the process is reduced to dropping a weight, then it becomes practical to drop the weight many times for a relatively small increase of expenditure.

A further stage of refinement is achieved by putting into the ground a shaped signal. It has been seen that a waste of energy comes from breaking up rocks and from using the wrong frequencies. The logical answer is not to break any rocks, and to put into the ground precisely those frequencies which will best be transmitted. Such ideas have been described by two groups of workers: by Crawford, Doty, and Lee, who have written of *Vibroseis* in *Geophysics*, and by Hales, who has written in the *Proceedings of the Royal Society*. These methods use, in effect, a swept frequency signal; a signal which starts perhaps at 20 cycles sec, and during a sweep of 5 or 6 seconds increases to 80 cycles sec. This has a number of advantages. First, the input signal is completely under control; what has gone into the earth is known, and for the first time, perhaps, there is a justification for complete mathematical analysis of the seismic process. It is possible to stack economically because the action of putting down a vibrator and vibrating is swift since it can be done every 15 seconds or so. An interesting and curious advantage is that because the time in which the packet of energy is put into the ground is extended to 5 or 6 seconds, the concentration of energy is low, damage is non-existent, and it becomes possible to conduct seismic surveys in highly built-up areas. If anyone has ideas on the London Basin, doubtless seismic surveys could be conducted in Piccadilly.

These last remarks can be summarized by saying that it was perhaps illogical that the developments came in the order in which they did and that the seismic industry should first devote so much attention and refinement to the recording end of its procedure before it had refined the input signal. The only excuse one can give is that invention is often illogical and doesn't follow the course which on hindsight would have been taken.

In this brief account of the advances of geophysics it has been necessary to be selective, and there are other lines of endeavour and advance which it has not been possible to deal with.

Speaking as chairman, A. F. Fox (Kuwait Oil Co.) said that his Company's seismic costs in terms of miles of traverse shot and of area mapped had decreased in the last two years compared with other years since 1950. Dr Fitch made a general observation that when a company became well-established in an area the need for further experimental work disappeared and techniques became well-established. The procedure of removing all the factors hindering operations then came into play and in a region with uniformity in its geography and geology costs could be cut in this way.

When opening the discussion P. A. Rankin (Hunting Aero-surveys) said that since reserves seemed to increase every year there appeared to be ample scope for all in the exploration field. Geologists and geophysicists were coming closer together and in fact they should no longer be two distinct professions.

The extension of the working season mentioned by Dr Fitch was particularly noticeable in the case of aero-magnetics. This was due to the use of radar navigation methods in aircraft, using the Doppler technique which now enabled operations to be flown almost anywhere, irrespective of low cloud and a great deal of bad weather, and without the aid of maps—particularly important in the early stages of exploration.

Two techniques using novel methods of promoting seismic waves which were especially preoccupying geophysical oil thinking were the Sparker and the Hydroson, both being shallow seismic methods for marine applications.

Prof. V. C. Illing paid tribute to the enormous amount of help that geophysics had given to the oil industry, particularly to the value of the Schlumberger log which had put an entirely different complexion on drilling, for not only was it now identifying the fluids in the rock and of the various strata encountered, but by comparing different wells, even in development drilling, geological information could be obtained to enable more specific exploration to be made for certain factors. When correlation was obtained by which one hundred or two hundred points in a log could be identified, the rest of the geological work became relatively easy.

Whether members of an exploration team called themselves geologists, geophysicists, or engineers did not matter. The expansion of reserves was the result of the combined work of those in the team.

Dr T. C. Richards was of the opinion that the use of the airborne gravity meter in the U.S.A. was still rather crude. It did not have the resolution required for making improvements to any interpretation of a sedimentary basin for which it would be primarily intended. The industry was interested in those rocks having a certain amount of cover, so that one was dealing with rather small gravity features—something much less than an airborne gravity meter survey could at present produce. It was difficult enough with surface gravity meters, with the high resolution they had today, to make a reliable interpretation of the gravity anomalies. He was of the opinion that the error in airborne observations was something like one hundred times that of standard observations of surface gravity meters.

A request for further details of the author's experience of the *Vibroseis* was made by Dr T. F. Gaskell. Was there any hope that it could locate smaller structures deeper than the present reflection method?

Dr Fitch expressed the opinion that the *Vibroseis* had a somewhat greater resolving power than the conventional methods which had been used in the past. It achieved this largely by its ability to "see through" the noise.

With a long signal of some five or six seconds being generated and used as an input signal, then each reflection coming back was a long signal of similar length. These would arrive one after another, interfere, and produce a very confused picture. To recover the signals required a correlation process had to be used by which the input signal was matched up against what was returned.

One of the features of the correlation process was that it was able to see the signal in an adverse signal-to-noise ratio of about 15 : 1. It was this feature which enabled the process to be operated successfully in noisy areas, such as towns, and in regions which were seismically very noisy. For a corresponding amount of work a cross-section was obtained which was greatly cleared of the noise which clutters up a typical seismic section. It was because of this freedom from noise that a higher resolution could be achieved from the *Vibroseis*.

The immediate restriction on the use of most of the new vibrators to the exclusion of methods used in the past was, as Dr Fitch pointed out, the fact that being heavy, those available at present were not favourable for portable work.

The speaker was asked, in the long development of handling records through playback mechanisms, how far was the amount of re-arrangement circumscribed by the original ground circumstances? Something was certainly gained by being able to playback; could one say that one would never require to go back and re-shoot? Or in what circumstances would one go back?

It was said by Dr Fitch in reply that even with the best facilities available in the central playback offices, it was still of the highest importance that the original field observation should be as perfect as one could make it. As an example of things going wrong, he quoted what happens when the shot is too shallow for conventional work. A very strong ground wave would be received and a reflection which had a much smaller amplitude. If that ratio were too great, then there was no way to recover a reflection signal without cluttering up the record with purely instrumental noise. The modern facilities were no excuse for sloppy work in the field, hence one must still strive for the very highest standard of recording.

W. E. Madden (Shell International Petroleum) remarked that reserves were calculated in many different ways, whether one was selling the reserves, or trying to buy reserves. Different criteria, safety factors, and so on, were applied depending on which way one was looking at the matter. It was practically impossible to come down to a standard method by which all reserves should be calculated in order that they might be published.

The reserves of the Athabasca tar sands had to be added to these published results. Whereas if the price of crude oil went up for some reason by a couple of dollars a barrel, the Athabasca tar sands would promptly be brought into the reckoning and would soon be available at an economic price. When the law of supply and demand began to work to that extent, there were large quantities of easily utilizable petroleum reserves available. Economics was going to dominate the calculations and utilization of reserves.

REDUCED SUBSCRIPTIONS FOR RETIRED MEMBERS

The Council of the Institute has been giving some thought to the possibility of introducing a special scheme for retired members to continue their membership at a reduced annual subscription, provided they have been associated with the Institute for a considerable period of time and have retired from a full-time position in the industry.

A scheme has now been approved and will come into force from 1 January 1962.

Any member of the Institute of Petroleum may apply to the General Secretary to continue his membership of the Institute at an annual subscription of £1 1*s* 0*d* per annum, whilst continuing to receive all the rights and privileges of full membership, providing the following conditions are fulfilled:—

(*a*) The member must have retired from full employment in the industry.

(*b*) The member must be 65 years of age and have been a member of the Institute of Petroleum for a period of not less than 20 years.

Why Drilling is Becoming Cheaper and Faster

By **E. E. FERRIN***

The key to successful drilling operations involves correct planning, the selection of the right personnel, and the proper use of good drilling equipment. This discussion will consider these elements in connexion with drilling operations in the Eastern Hemisphere. In addition, it is intended to point out various methods whereby wells could be drilled in a shorter time which, in most cases, would result in lower well costs.

The drilling industry to-day is undergoing some major changes. Mounting costs and world surpluses of oil are requiring economy measures in all areas of the drilling business.

Most operating companies in the Eastern Hemisphere have large areas to be evaluated. For a fixed sum of money allocated to exploratory drilling, it should be possible to obtain a better overall evaluation by drilling a number of exploratory wells over the area, rather than drill a relatively few wells where detailed information is obtained. I believe that the use of fast drilling techniques has a definite advantage in exploratory operations.

Importance of Planning

Let us consider that a drilling programme is to be undertaken in a hypothetical country. Such a programme could be for one or more wells, and careful planning at this stage is most important. The geologists should have reliable information as to the type and age of the formations to be penetrated and possible lost circulation zones. The drilling engineers will want to know the proposed total depth of the hole that will be necessary to either find commercial production of oil and gas or to condemn the area. With this information the drilling engineers will then be able to design an economical casing string, specify the mud programme, and make recommendations on the bit programme.

At this stage the drilling programme should be fairly well established with the following points as a basis:

1. The area of operations, *i.e.* mountainous country, sand dune country, marshy country, etc. The accessibility should also be known, as well as the probable number of tests required.

2. Availability of water. Both quantity and quality should be considered.

3. Depth of hole planned and maximum depth which may be required if commercial production is not found at the planned depth.

4. The casing programme and the size of the hole to accommodate the casing strings should be agreed, with due consideration being given to possible lost circulation zones, the planned depth, and size of hole desired at the total depth.

5. From the best available information, the drilling engineer should decide on a mud programme and should have alternative plans in the event unusual conditions are encountered.

6. Careful attention should be given to the selection of special services such as drill stem testing, electric logging, mud logging devices, gas detectors, etc. Only those services that will contribute to the proper evaluation of the hole should be considered.

7. Coring operations for geological information should be planned in connexion with the special services available, well samples to be collected, and with a realistic appreciation of the cost of coring operations.

Oil companies to-day are operated under some form of budgetary system, and, at the time the geologists and drilling engineers are making detailed plans, it is essential that these technical people be aware of the many cost factors which finally end up in the total cost of the well. Each and every point in the drilling programme should be evaluated as to the need for each proposal and the cost to carry out the various segments of the work programme.

Transportation

An equally important point in planning a drilling programme concerns transportation of not only the complete drilling rig but the tubular goods, materials, and supplies necessary for a successful operation. Modern drilling practice favours the use of packaged units so that there is a minimum of rigging operations. The extent to which such units can be used to advantage depends on the anticipated transportation problems, but in general the use of the largest possible "package" consistent with the means to transport the equipment to the location will be the best procedure.

A few years ago when entering a new area it was usually necessary for an operator to provide all road building equipment, and a full fleet of oilfield trucks and trailers, together with such personnel transport as the operation required. The present general practice is for these items to be either furnished by the drilling contractor and/or a local transportation contractor. Transportation of bulk materials is now a part of the servicing of a drilling operation that can usually be handled by one or more local trucking contractors, and such use of local concerns is considered to be very good public relations. Some form of competition between local trucking contractors coupled with realistic rates for services performed can be a satisfactory arrangement for the operator.

Many new drilling areas require extensive road construction work, whereas in sand dune country the transportation problems are handled by use of special "off-the-highway" equipment such as the large sand tyred units which have been widely used in both Arabia and North Africa. Road construction in mountainous areas can be extremely expensive and one should guard against overbuilding. Modern oilfield trucks with ample horsepower can negotiate steep grades and this factor should be considered in planning the access road.

In special cases, the use of helicopters for transportation of restricted weight packaged rig units should be carefully considered, but the high cost and limitation of this type of operation is such that this method of handling the transportation requirements has a very limited field.

Spare Parts, Materials, and Supplies

At this stage in planning a drilling programme, some

*Gulf Eastern Company.

consideration should be given to the provision of equipment, materials, and supplies necessary to support the operation. One of the major advantages in the use of contract rigs is that the contractor will usually provide all the necessary spare parts for the drilling machinery. In this way the operator is not concerned with warehousing of the many items of rig spares usually required with company owned tools. Furthermore, the contractor seems to get along with far less spares under this arrangement.

The proper selection of bits for a drilling operation is a controversial subject which can be greatly simplified if the drilling contractor furnishes all drilling bits. Dual responsibility in this matter is unsatisfactory, and when the operator furnishes the drilling bits, there is a strong tendency to overstock and he is usually left with a large stock of the wrong types. When the contractor furnishes the drilling bits, more attention will be given to the use of best possible hole makers.

An adequate supply of cement, drilling mud, and chemicals should be on hand at the rig location or at some convenient storage area not more than 24 hrs away. The amount to be stocked at each storage area will be determined by conditions expected at each drilling operation.

A one-well drilling programme, regardless of whether it is classified as a wildcat or development well, should be provided with all tubular goods necessary to complete the well as a producer. While the oil string and tubing need not be moved to the location these vital strings should be stored nearby. An exploratory drilling programme involving more than one well does not necessarily require all of the tubular goods, but one complete oil string should always be readily available. Perhaps this philosophy can be classified as "positive thinking".

Selection of the Drilling Contractor

There are many different ways of operating rigs in drilling work ranging from a company owned and operated rig to the use of a contract rig on a full turnkey basis where the contractor furnishes all of the equipment, personnel, and materials necessary to complete the well. Under present day conditions, I believe that the best procedure from the standpoint of both the contractor and the company is the use of contract rigs and crews on a footage basis to a predetermined depth or until some marker has been reached, such as the cap rock or the top of a pay zone. Below this depth, the contractor would be on a daywork rate.

The contractor should furnish all necessary rig spares, supplies, bits, transportation, and services other than special services. If possible, the contractor should also be responsible for fuel. Other services such as electric logging, drill stem testing, and cementing services, the cost of which is difficult to estimate, should be supplied by other contractors who specialize in this type of work, but these services are usually for the account of the operator.

Most of the wells drilled in the United States utilize contract rigs under some type of footage rate. This method has recently been introduced into certain areas in the Eastern Hemisphere with excellent results, and I believe that this type of operation will be greatly increased in both development drilling as well as in exploratory drilling.

The contractor should be protected against special transportation problems, lost circulation, excessive deviation, and very hard formations which he cannot anticipate without unduly increasing his bid. In addition, the contractor should be given sufficient incentive to make a good profit if he does a good job. With proper incentive a good contractor will supply his best drilling personnel, the well will be drilled quickly, and the well costs should be reduced.

Contract drilling is a highly competitive business, and those contractors who have survived the past few years are vitally interested in their reputation as "good contractors".

Modern drilling contracts should be prepared in such a way that the contractor can furnish and be responsible for all items that can be estimated with reasonable accuracy. Divided responsibility between the contractor and the operator in respect of materials and supplies can lead to expensive delays. It is a curious thing, but most contractors can obtain urgently needed spare parts much faster than the large operators as the contractor usually has a smaller and more efficient purchasing and expediting group.

Selection of Drilling Equipment

In an operation where the contractor furnishes the complete drilling rig and ancillary equipment, the operator is not concerned with the purchase of the equipment. The operator, however, must be able to evaluate and compare the drilling equipment offered by the various bidders, and then pass judgment on the ability of each rig to handle the proposed drilling programme.

At this point, it is desirable to review the drilling programme in detail with particular reference to the planned drilling depth and maximum depth which may be drilled if the original objective is not productive. An operator who selects a heavy duty rig and drills relatively shallow holes will find the transportation costs too high. On the other hand, a medium duty or light duty rig can be used to drill a small hole to depths generally considered to be outside the depth range of these rigs, but the time required to make trips and extra maintenance will run up that important factor called "cost per foot".

There is no real answer to this important problem other than to know as much as possible about the work to be done and select the rig accordingly.

One of the odd things about drilling rigs is that the complete rig is often described by the type of hoist furnished with the rig. For instance, one hears the phrases *National 130*, *Ideco Super 7–11*, and *Oilwell 96*, and one then forms an opinion as to the work that each rig can perform.

Modern drilling techniques involving fast rates of penetration are more dependent upon the pumps than upon the hoist. There is a growing tendency to increase the size of the pumps and the prime movers used to drive them. In this way, maximum advantage can be obtained by applying good hydraulics to drilling. There is not sufficient time available for further discussion on this interesting subject, but I believe that the proper application of modern drilling hydraulics is one where there is the best opportunity to show the most improvement in the rate of penetration.

Air drilling methods have been used with remarkable results in certain areas in the United States, but the use of air drilling methods in the Eastern Hemisphere has not been too popular. I believe that there is room for considerable progress in the use of the so-called mist drilling and aerated fluid drilling operations, particularly where lost circulation with mud is a problem. The use of these methods sometimes called "reduced pressure drilling" should be carefully considered when one is searching for a method to penetrate lost circulation zones, particularly where the water supply is limited.

Much has been written about important applications to the science of making hole, such as:

1. Rock bit design and proper usage.
2. Bit weight and rotary speed.
3. Drilling fluids.
4. Good hydraulics.

All of these contribute to "getting the hole deeper" in the shortest time possible. Each of these subjects is so important that they should be considered for presentation to a later symposium by specialists in their respective fields.

Personnel

I would now like to discuss the personnel required to supervise a drilling operation. The vast amount of money expended in drilling operations makes it imperative that there should be a clear and distinct understanding as to the responsibilities of both the company's and the contractor's supervizors. Furthermore, there should be mutual respect and co-operation between these groups.

In my opinion it is the responsibility of the company drilling supervizors to furnish the contractor's supervizor with a complete and logical drilling programme in sufficient time for the contractor to plan and carry out the work programme in an economical manner. Alterations in a programme should be made in plenty of time for any additional items of materials and supplies to be brought to the location so that there will be a minimum of lost time to the contractor. Consideration should be given to having one or more alternate plans which could be implemented under certain specific conditions by the supervisor on the rig.

Company supervisors should not be permitted to give orders directly to the driller or his crew without the consent and knowledge of the contractor's supervisor. The primary function of any company supervisor should be to act as a representative looking out for the company's interest, and to generally co-operate with the contractor's supervisor. The company drilling supervisor should be seeking ways and means whereby the well can be drilled in a more efficient manner.

Radio telephone service should be available to the company supervisor to provide a means of direct line communication with line supervisors and technical advisers. Good communications are most essential in modern drilling procedures where time is money.

The drilling contractor's head supervisor on the location has a very important position. He must be a drilling expert, a fishing expert, a politician, a manager, and a diplomat in order to cope with the many day-to-day problems connected with his work. A contractor's success in a drilling operation can usually be traced to the contractor's supervisor who has the respect of all the men on the job as well as his superior who will provide him with the men and materials required to get the job done.

I have discussed the responsibilities of both the company's and the contractor's supervisors, and I believe that you will agree there should be a clear cut amicable agreement concerning the responsibilities of both groups. Under such an arrangement, all concerned will know what they are supposed to do and they will usually carry out their duties with confidence.

There is one controversial subject which I would like to mention in this paper, and that concerns the responsibility of top management. It seems to me that the responsibility of the head office should be restricted to the selection or approval of the company personnel to run the drilling operations. Their selection could be restricted to the man in charge of all drilling operations; this man should then be given both responsibility and authority to run the operation. Top management should inform those concerned about their general views on drilling operations which should then be followed.

I believe that there should be no day-to-day direction of the drilling operations by top management, but if the overall results are unsatisfactory then appropriate changes in the drilling organization should be effected. Poor decisions often result when an executive with outdated drilling experience attempts to give detailed instructions on incomplete information. On the other hand, he should provide his organization with the very best drilling supervisors possible and then let these people run the show.

There is a vast amount of technical information appearing in trade magazines which should be made available to the drilling supervisors and others who will take the time to read such articles. The modern day drilling supervisor should have an open mind about new techniques which will improve the overall drilling operations.

Application of Modern Drilling Methods

At the beginning of this paper I stated that the key to successful drilling operations involves correct planning, the selection of the right personnel, and the proper use of good drilling equipment. I would now like to quote an example where these elements have been successfully applied in one of Gulf's operations in South Louisiana.

An article in the 27 March issue of the *Oil and Gas Journal* described the drilling of a well to a depth of 10,000 ft in 3·4 days. This has since been surpassed, and the latest record established in the area is 2 days 2 hr and 30 min to 10,000 ft.

These records are the outgrowth of a distinctive, clear, and definite plan which was developed for the principal purpose of reducing rig time required for drilling operations. The plan has been referred to as "massive elimination", which involves the elimination of all work which, in the ultimate analysis, actually need not be done.

Timbalier Bay in South Louisiana is an area where self-contained drilling barges with heavy duty drilling equipment can be used to advantage, and in this coastal area there is an ample supply of either brackish or salt water for drilling fluid. These special conditions are certainly not applicable to say the Libyan desert, but a review of the methods used in Timbalier Bay to reduce drilling time is most interesting.

A time and motion study of common drilling practices showed that much labour and rig time was used to install well-head equipment and blow-out preventers. With this point in mind, a new well-head assembly was designed by the drilling engineers to reduce rig time and yet safely control the high pressures that may be encountered. This special well-head assembly was installed on the conductor pipe with both the conductor pipe and well-head usually set by a small portable rig before the heavy duty drilling rig was moved on to the location, thereby saving valuable rig time. Once the blow-out preventers were installed, they were not removed until the Christmas tree was ready to be put on the well just prior to completion. It was estimated that the new well-head assembly decreased rig time by about 2½ days as compared with conventional equipment.

The hydraulic programmes were such that jet velocities were in excess of 600 ft/sec and annular velocities above 200 ft/min. The pump pressures on the surface required to give these performances through 5-in drill pipe ranged between 2500 and 3100 psi. Mud pumps of 2000 hp will provide these hydraulics, and similar heavy duty pumps are part of

the drilling machinery on the modern heavy duty drilling barges.

Rotary speeds were high and varied between 180 and 450 rev/min. Such speeds were made possible through the use of 600–1000 hp rotary drives operated by electric motors which provided the necessary flexibility.

Bit weights from 50,000 up to 100,000 lb have been used with good results, the average being about 70,000 lb on 9⅞-in bits.

Drilling fluids were carefully controlled on these high speed wells to produce the best results. Weights were as low as safety permitted with a minimum of about 10 lb/gal. Near the surface, clear bay water or sea water could be pumped into the drill pipe when the drilling rates were between 250 and 500 ft/hr. At this penetration rate enough solids were picked up from the formation to get 10 lb/gal mud returns to the surface. Such drilling practices will make "snowbank digging" out of formations that were formerly described as hard sand and shales.

All practices, motions, and manoeuvres which required labour or consumed rig time were critically examined. Many time consuming practices were either omitted or used in a more efficient way on the fastest wells.

As a result of this time and motion study, the connexion time was reduced from 4½ min to 1½ min. The time to handle drill collars and change bits on trips became the subject of another study, which eliminated extra work and was much easier for the crew. Connexion time was reduced another 25 per cent by simply changing over to API range 3 drill pipe.

Slope tests were found to be another source of wasted rig time. In some fields they were eliminated entirely and in other areas they were reduced from one on each 250 ft to about one on each bit change. The drillers were instructed to assume the hole to be straight and to apply bit weights accordingly. Directional logs were run on these wells prior to setting casing. In most cases the holes were found to have suffered very little excessive deviation from vertical.

All mud conditioning and treatment was done while making the hole. This called for revised planning, greater skill, and more overall knowledge by the drilling fluid engineers. Mud treatment was applied to eliminate approaching problems rather than to correct current problems.

The practice of back reaming or drilling each joint down at least twice is fairly common with many drillers on the Gulf Coast. This practice was arbitrarily eliminated on the fastest wells. In most wells the practice of drilling an undersized hole, then reaming the hole to the desired size, was eliminated from the programme. Instead, the surface holes were drilled with a full gauge string reamer above the bit.

"Waiting on orders" was practically eliminated on the fastest wells. This was made possible by: (1) increased rig supervisor's authority, (2) having approved alternative plans, and (3) direct contact with line supervisors and technical advisers over radio telephone communications systems.

It should be remembered that these records have all been set by using heavy duty contract rigs under very definite plans and supervised by people who have the will and the ability to get things done. The main objective of all those involved in such a drilling operation is to "get the hole deeper".

These drilling records are impressive, and while it should be pointed out that the time required to reach a depth of 10,000 ft does not represent the overall rig time required to drill and complete these wells at the total depth, it goes a long way toward reducing the total cost. The figure of 10,000 ft is merely a convenient number or yardstick.

In addition, these records are being made under special conditions which will not necessarily be applicable to all drilling areas. The point is that these wells are planned and engineered to take advantage of the special conditions existing at Timbalier Bay.

The first reaction of most drilling supervisors is that the methods used in Timbalier Bay are not applicable to their operations. This may very well be true, but I am convinced that any drilling operation can be improved by "correct planning, the selection of the right personnel, and the proper use of good drilling equipment".

Discussion

Considerable surprise was expressed at the very fast drilling rates that had been quoted by Mr Ferrin in his paper. These had been achieved almost entirely by conventional drilling equipment, properly controlled and engineered, and it was said that a great deal of criticism could be levelled at other operations elsewhere.

Mr Ferrin said that he had had no personal experience of turbine drills, but he thought that if the same horsepower were applied to ordinary rotary methods one would achieve better results than by using turbine drilling; all the rigs in South Louisiana that had been mentioned in his paper applied power to the bit. Rotary drilling was very difficult to beat if used in the proper way.

When asked to analyse the rig time on these jobs, Mr Ferrin told the audience that the drillers tried to avoid running trips. The best rock bits were used, and when a trip was made there was no excess work involved as everything was there to make the work easier. On some of the fastest trips three or four bits were used down to 10,000 ft—a very small number as compared to conventional drilling methods.

Many aspects of the use of drill-collars were found to be time-consuming. With 70,000–80,000 lb of drill collars it took time to break up and join, and on making a trip pulling them out and derricking them. The conventional procedure of putting a safety clamp around the top of the slip and dropping it in the hole was found to take considerable time, so the clamp was no longer placed there.

On the question of the use of helicopters, compared to travel by boat, in offshore work, Mr Ferrin pointed out that crews were transported to rigs over distances of sometimes 100 miles from base. In Louisiana offshore areas workers were paid for travelling time, so it was to the advantage of the contractor to have some fast means of transport available. Many drillers were also bad sailors and did not like eight- to ten-hour boat trips.

In the Timber Bay operations it was probable that a 7¾-in drill collar was used on a 9⅞-in bit. Reamers had been used in the hole, but he did not think that stabilizers were used in that area.

A. N. Thomas (British Petroleum Co.) drew a comparison with the Louisiana operations described by Mr Ferrin where 10,000 ft were drilled in just over two days, by citing a recent hole drilled in the Alberta foothills which took four months to drill 1000 ft. The rocks there were hard sedimentary quartzites and drilling bits had been ground away in a few feet. He pointed out that with all the modern techniques, in certain formations old-fashioned methods such as cable-tool drilling could still be several times faster than the use of rotary techniques.

In answer to a question on the effectiveness of air drilling, Mr Ferrin told of some Pennsylvanian gas fields that were particularly suited to this application, and without its use they would never have been developed, being marginal wells. Greater success had been achieved in that area than in any other part of the world.

Foam drilling, or aerated fluid, was a variation of air drilling. In Libya the drilling rate in a certain region had been greatly increased by the use of an aerated fluid, which was nothing more than mixing air in a light-weight mud into the stand pipe. This tended to reduce pressure in the bottom of the hole.

Some developments in sonic drilling were traced by Dr Gaskell. A sonic drill had been developed—a magneto-striction one of several thousand cycles per second frequency—by the Battelle Memorial Institute for a group of oil companies and contractors. Sufficient electric power could not be transmitted down to the instrument at the bottom of the hole, and the project had run out of money before the tool could be made to work. A second sonic drill had been developed by Borg-Warner but it was thought that this project had been abandoned. The only practical sonic drill was that of the Gulf Oil Co., a low-frequency combined rotary percussion drill—called a hammer drill by Mr Ferrin, on half-frequency vibration—which had not yet been developed commercially.

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

Stanlow Branch

A. S. Brooman, Shell Refining Co. Ltd, was elected chairman of the Branch for the 1961–62 session at a recent committee meeting. V. Biske, Lobitos Oilfields Ltd, was elected to serve as honorary secretary, and J. E. Winterbottom was elected honorary treasurer for the session.

Bahrain Branch

At the 7th Annual General Meeting of the Branch, the chairman, W. H. Cotter, said in his Annual Report that during the year seven technical papers and talks and two film shows had been given which covered most spheres of interest of the branch members. The Symposium and Annual Dinner held in December was declared a great success, guests being present from many Gulf oil companies, and the Guest of Honour was Rear Admiral A. M. Jackson (U.S. Navy).

The new Committee elected at the Annual General Meeting took office in May, the following officers being appointed:–

Chairman: D. G. Johnstone
Vice Chairman: B. C. Hyde
Hon. Secretary: J. Ball
Hon. Treasurer: H. D. Knight
Committee: E. A. Allen, R. Turtill, W. H. Cotter (Retiring Chairman), and R. J. C. Windebank

At the 67th Ordinary Meeting held on the 1 May W. A. Isaacs, manager Producing and Development, Bahrain Petroleum Company Ltd, gave a slide illustrated paper on "Amphibious Drilling". He briefly covered the early survey work which led to the decision to drill a well on the submerged anticline north of Bahrain, and then discussed the many problems associated with the project. After careful analysis of cost and equipment available, it was decided to construct a steel platform on steel piles driven into the sea bed with a 165-ft National rig, with ancillary equipment erected on this platform; a formidable task in view of the confined space available. Mr Isaacs paid a great tribute to the men on the project, in that throughout the whole operation no lost time accident occurred, and only 48 hours drilling time were lost in fishing operations. R. E. de Mestre proposed a vote of thanks to Mr Isaacs for his extremely interesting and informative talk.

On 5 June a most interesting talk was given to members and guests by R. Delhostal of Schlumberger Overseas, S.A. on the "Sonic Log".

The speaker opened with a description of the tools used in running a sonic log, the full equipment being on view to the audience and later being demonstrated. The relative position of the transmitter to the three receivers was shown together with the cartridge which housed all the electronic devices and other surface instruments.

The function of this relatively new process for logging was explained, and the method of interpretation of the logs to give the effective porosity of a formation. The speaker also indicated how the sonic logging equipment could be modified to show the effectiveness of a cement bonded casing by measurement of a specific amplitude of the return sound wave.

The interpretation for effective porosity and the presence of hydrocarbons or otherwise was shown by the application of various equations, correction factors, and graphs for consolidated and unconsolidated water wet formations either shale free or containing shale. Information and results obtained by the use of lateral and neutron logs was essential to the working out of some of the equations.

Birmingham Students Section

The newly re-formed Students Section has arranged a full winter programme. The first meeting will be held on 21 November, at 5.20 p.m. in the Department of Chemical Engineering, University of Birmingham, when D. Vickery will give a talk "Careers in the Oil Industry". Visitors are most welcome. Futher details can be obtained from the Hon. Secretary of the Section, at the above address.

COUNCIL ELECTIONS

Members are reminded that, under By-law 72, all nominations for Council Elections in 1962 must be received by the General Secretary not later than 31 December 1961.

Applications must be made on the special Council Election form, proposed by a corporate member, and supported by six corporate members. Forms are obtainable from the General Secretary.

CADMAN MEMORIAL LECTURE AND MEDAL

The Sixth Cadman Memorial Lecture will be delivered by Sir Stephen Gibson, C.B.E., on 31 October 1961, in the hall of the Royal Institution, London. The Medal will be presented to him by the President. The subject of the lecture will be announced on the day of the presentation.

The lecture will commence at 4 p.m. and tea will be provided after its conclusion.

Opening of the Kalundborg Refinery

Denmark's first oil refinery was officially inaugurated at a ceremony at Tidewater's Kalundborg refinery on 18 August.

Dansk Veedol, the operators of the new refinery, are a wholly-owned subsidiary of Tidewater Oil Co., and will transport and market its products throughout Denmark. Norske Veedol, a subsidiary of Dansk Veedol, will distribute the company's products in Norway.

The refinery, which is also Denmark's largest industrial enterprise, is now nearing completion, being scheduled to come on stream late this year. It has an initial design capacity of 20,000 bsd with provision for expansion to 40,000 bsd. It is located on a 550-acre site south of Kalundborg on the west coast of Denmark, and 140 acres of the site are at present occupied.

Construction of the refinery started in June 1960, the main contractor being Foster Wheeler Ltd, London. The major part of the subcontract was given to Danish firms. Air cooling is used almost exclusively as a means of minimizing the use of water thus limiting the problem of water pollution, and electronic instrumentation is used throughout the plant.

Principal processing units include a crude oil desalter, an atmospheric distillation unit, naphtha and vacuum gas oil hydrodesulphurizers, a catalytic reformer, a vacuum distillation unit, and various treaters.

The main tower of the vacuum distillation unit has been designed to operate "dry"—without injection of steam for stripping or partial pressure effect, and has a height of 88 ft and a diameter of over 27 ft.

Atmospheric and vacuum heaters are of Foster Wheeler design with horizontal firing and conventional radiant and convection chambers, with provision for steam superheating. Units have also been designed for the future addition of petroleum chemical facilities as needed.

Electricity will be obtained from a neighbouring power plant but the refinery will have its own steam generating equipment. Estimated annual electricity consumption will be 50 million kWhr—five times that of the city of Kalundborg.

The tank farm consists of 32 storage tanks and will have a total capacity of 1,590,000 brl. A pier jutting half a mile into Kalundborg Fjord will provide two berths for tankers of up to 46,000 tons, and has been further designed to permit the handling of ships of up to 73,000 tons with additional dredging. The pier was designed and built by Christiani and Nielsen, of Denmark. Fourteen pipelines and the necessary pumping installations can handle 4500 tons of crude an hour.

Tankers from the Kalundborg refinery will supply products to the six deep-water terminals that have been built in Denmark, plus a major terminal in Norway. The six Danish terminals will have a combined storage capacity of approximately one million barrels, and are located at Aalborg, Frederikshavn, Copenhagen, Odense, Aabenraa, and Aarhus. The central terminal in Norway is at Kambo Moss, near Oslo.

Products which are to be marketed initially include motor spirit, jet fuel, diesel oil, kerosine, gas oil, light and heavy fuel oils, and several speciality products. No lubricating oils are to be produced at Kalundborg at present.

Heating oils will be distributed by a subsidiary, Veedol Handels Compagni A/S, which is owned jointly with two private Danish concerns, and markets both heating oils and coal.

Denmark's energy consumption pattern has been steadily changing over from coal to oil. Some 58 per cent of the country's total energy is now produced from petroleum and it is estimated that by 1970 this figure will have risen to 75 per cent.

* * *

SIRIP's New Drilling Platform

The *Gatto Selvatico*, SIRIP's new drilling platform, which was towed from Italy to an offshore location in the Persian Gulf recently, has started drilling operations. The latest progress report was that the well, SIRIP Offshore-4, had reached 590 ft, with the last casing set at 443 ft.

The new platform has a triangular hull, with a leg at each apex, and it can operate in depths down to 115 ft. Apart from a cost advantage, the three-leg structure of the rig simplifies manoeuvring and navigation in the open sea.

The *Gatto Selvatico* has an upper and lower deck, with the derrick and substructure of the rig mounted on the upper deck. Two R. G. Le Tourneau revolving cranes for loading and unloading materials are also located on the upper deck, while crew quarters are included in the bridge house.

The lower deck houses the diesel-electric station containing six Fiat-Marelli generating sets, which have a maximum total power output of 4200 hp and drive the drilling rig and supply the power for all other services; water pumps; air-compressors, and other auxiliaries; as well as two Ideco-Pignone MM-1250 and one Pignone type 7½ · 10 slush pumps. Mud tanks and bins for cement and mud components are sited along the sides of the hull near a bulkhead which shuts off the engine room. Tanks for fuel, lubricants, and drinking water are contained in the vessel's double bottom.

The electrically operated drilling rig, Ideco Pignone Type E2500, has 2500 hp and can drill to depths between 19,700 ft and 22,300 ft. The derrick, which was designed and built by Nuovo Pignone, and substructure slide on two longitudinal guides, and can be moved from the working position at the stern to the centre of the hull to give a better distribution of weight when the platform is floating. A Halliburton cementing unit is included in the drilling equipment.

A mud laboratory, which includes a Schlumberger unit to determine the electrochemical properties of the mud, and a geological laboratory are also included in the barge.

The legs are raised or lowered independently through gears which mesh with the teeth of the three racks of each leg. Compared with tubular legs, the triangular truss structure of the legs offers a lower impact surface to wave motion, reducing the stresses to which the unit is subjected. The lower part of the legs consist of cylindrical spud tanks to provide extra stability when lowered, and extra buoyancy once the water has been removed from them, when the platform is floating.

The *Gatto Selvatico* can withstand a maximum wind velocity of 100 mph and the wave motion developed under these conditions.

New Products Pipeline Completed in Iran

525-mile Route Links Teheran–Shahroud–Meshed

Iran's new 8-in products pipeline, running some 525 miles from Teheran (Rey)–Shahroud–Meshed, was completed and tested recently.

The line, which is buried to a minimum depth of 18 in, generally follows the main road linking the three towns, but it diverges at some points where it has been possible to economize on the length of the line without hampering access to it. Where it passes under road or rail crossings special casing is fitted to provide protection against shock.

The Rey–Shahroud section will have an eventual capacity of 795,000 tons/year of kerosine and the Shahroud–Meshed section 700,000 tons/year. But these totals are not likely to be achieved before 1967 ot 1968 when the last of the four pumping stations is due to be completed.

These stations will be located at Rey, Semnan, and at a site located some 170 miles from Shahroud on the route to Meshed. The Shahroud station is scheduled to come into operation towards the end of this year and those at Rey and Semnan towards the end of 1962.

Until the one at Rey is completed, an existing pumping station, which was built for use on the line running to Resht and is unlikely to be fully used until early in 1963, will pump products to Shahroud. But, because this station has a pumping rate of only 195 IG compared with the rate of 300 IG of the Shahroud station, tight line pumping and tank to tank operation will not be possible until the booster station at Semnan is completed.

The Pumping Stations

The pumping station at Rey will have three electric driven pumps installed in series, and these will be made interchangeable as a group with the pumps for Resht. The products will be metered from the tanks and will pass through fine mesh, self-cleaning strainers to remove sediment. A chemical inhibitor will be added to the product to prevent internal corrosion of the line. To save power requirements, it is possible to divert the inflowing product from the tanks by pump suction.

Laying pipe on the Teheran–Meshed route

Straight and true. A section of trench in a remote area along the pipeline's route

The booster station at Semnan will be remote controlled, and will have two 20 kW diesel generators, one of which will be in continuous operation with automatic change-over taking place at pre-determined intervals and when faults occur. To start with, a single pumping unit is being installed but a second unit will be added later. The station will normally operate by remote control from Rey, but remote start up will not be possible until telecommunications are established with Rey, and initially start up will be by push button and a sequence control system. The speed of the main engines at the station will be controlled and adjusted by station back pressure at Shahroud. The station will transmit information to Rey automatically on a time interval basis, but there will also be provision for selective calling.

The Shahroud station will have three diesel engine driven series pumps similar to those at Rey. But, unlike the Semnan booster station, the one at Shahroud will be attended. Three tanks, each of 2·2 million litres, will be provided for each product.

The depot at Meshed will have a total capacity of 50 million litres and road tanker loading capacity of 750 litres/min.

The total content of the line will be some 274,000 brl, consisting of 120,000 brl on the Rey–Shahroud section, and 154,000 brl on the Shahroud–Meshed section. Cathodic protection has been provided, and the route will be identified by markers, some of which will be visible from the air.

World Petroleum Statistics 1960

The U.S. Bureau of Mines' *World Petroleum Statistics**—1960 records a 6·6 per cent growth in the free world's production of crude petroleum in 1960 to 6474 million brl. Production in the Soviet-Sino Bloc for the year was estimated at 1210 million brl, some 14·3 per cent more than in 1959. This means that the free world was responsible for some 84 per cent of the total world output of crude in 1960.

The Western Hemisphere, responsible for about two thirds of the free world's output, achieved a modest 2 per cent increase over the year. In North America, U.S. production remained static at 2575 million brl, largely as a result of a reduction in petroleum stocks and increasing competition from imports and natural gas, and Canada and Mexico showed increases of 8 million and 3 million brl respectively. Venezuela and Argentina, where output rose by 30 million and 19 million brl, were largely responsible for a 5·2 per cent increase in S. America.

By contrast, Eastern Hemisphere production jumped by 16·2 per cent. The Middle East produced an extra 243 million brl, with impressive increases in Kuwait, Saudi Arabia, Iran, and Iraq. A 150 per cent rise in Africa was largely the result of rapid expansion in the French Sahara, where output rose from 10 million brl in 1959 to 67 million brl in 1960. The U.S.S.R. produced 1080 million brl, exceeding Venezuelan production, according to the Bureau of Mines, by some 38 million brl to move up from third to second place behind the U.S. as a producing country.

World imports of crude petroleum in 1960 were 2655 million brl, and exports and re-exports 2663 million brl. Within the free world, the difference between imports of 2648 million brl and exports and re-exports of 2602 million brl reflects Soviet bloc exports to the free world of 54 million brl, which was 13 million brl higher than in 1959. Total movements of crude within the free world were 12 per cent above 1959.

The statistics give imports of refined products by free world countries as 1197 million brl, but it is believed that actual imports may have been about 1433 million brl. The higher figure is based on the figure for the free world's exports and re-exports, which were 1342 million brl, and shipments from the Soviet bloc of 91 million brl. The discrepancy between the free world figures for imports and exports and re-exports is largely accounted for by the failure of many countries to include entries or withdrawals from bond and military receipts in their trade statistics. Since Soviet bloc imports of refined products are negligible, the figure of 1433 million brl also represents total world imports of refined products.

World output of refined products rose by 8·2 per cent to 7927 million brl. The free world's total of 6785 million brl was 7·6 per cent higher than in 1959, and accounted for 86 per cent of the world total. The Soviet bloc's total increased by 12 per cent to 1142 million brl.

The free world's increase of 482 million brl occurred mainly in the Eastern Hemisphere. West European output was 196 million brl, or 17·3 per cent higher, while in the Middle East output rose by 13·7 per cent, or 54 million brl. In South Asia, the Far East, and Oceania output was up 84 million brl, mainly as a result of increased production in Japan, but with significant gains in Australia and India also.

Of the major refined products, free world output of gasoline rose 4 per cent to 2259 million brl, kerosine and jet fuel 10 per cent to 472 million brl, distillate fuel oil 2 per cent to 1353 million brl, residual fuel oil 13 per cent to 1784 million brl, and lubricants and grease 7 per cent to 91 million brl.

* *World Petroleum Statistics*—1960, prepared by J. V. Hightower, Commodity Industry Analyst, under the direction of Donald S. Colby, Branch of Petroleum Economics, USBM, WPS, No. 156.

TABLE I
WORLD SUPPLY AND DEMAND CRUDE PETROLEUM AND REFINED PRODUCTS, 1960
(Thousands of Barrels)

Country	Crude Petroleum				Refined Products	
	Production	Imports	Exports and re-exports	Stock change, other demand, and loss	Imports	Exports re-exports
NORTH AMERICA						
Canada	192,842	125,560	42,235	−2,207	35,298	2,295
Mexico	99,049	—	1,103	−1,950	7,895	6,447
United States (including Alaska and Hawaii)	2,574,933	371,575	3,091	−2,117	294,098	70,798
Sub-total	2,865,824	497,135	46,429	−13,274	337,291	79,540
CENTRAL AMERICA AND CARIBBEAN						
Costa Rica	—	—	—	—	(*E*) 1,034	—
Cuba	(*E*) 108	(*E*) 22,552	—	−374	(*E*) 4,548	—
Dominican Republic	—	—	—	—	(*E*) 2,835	—
El Salvador	—	—	—	—	(*E*) 1,588	—
Guatemala	—	—	—	—	(*E*) 2,921	—
Haiti	—	—	—	—	(*E*) 620	—
Honduras	—	—	—	—	1,495	—
Jamaica	—	—	—	—	5,423	—
Nicaragua	—	—	—	—	(*E*) 1,418	—
Panama, Canal Zone	—	—	—	—	8,045	1,994
Panama, Republic	—	—	—	—	(*E*) 2,774	—
Puerto Rico	—	26,469	—	+158	5,665	13,485
Sub-total	108	49,021	—	−216	38,366	15,479
SOUTH AMERICA						
Argentina	64,232	22,982	—	+1,511	13,835	11
Bolivia	3,574	—	1,088	+225	122	44
Brazil	29,613	40,139	4,297	−1,028	(*E*) 30,084	—
British Guiana	—	—	—	—	1,672	—
Chile	7,231	3,584	—	−49	(*E*) 5,437	—
Colombia	55,666	—	31,661	−845	1,030	4,096

TABLE I
WORLD SUPPLY AND DEMAND CRUDE PETROLEUM AND REFINED PRODUCTS, 1960—(*continued*)
(Thousands of barrels)

Country	Crude Petroleum				Refined Products	
	Production	Imports	Exports and re-exports	Stock change, other demand, and loss	Imports	Exports and re-exports
SOUTH AMERICA—(*continued*)						
Ecuador	2,730	1,459	—	−55	248	—
Netherlands Antilles	—	261,023	1,783	−368	17,360	234,905
Paraguay	—	—	—	—	811	—
Peru	19,255	—	2,591	+122	4,076	3,055
Trinidad	42,357	40,218	5,071	−4,396	1,565	63,190
Uruguay	—	9,267	—	−222	1,782	—
Venezuela	1,041,708	—	730,962	−12,180	543	251,782
Sub-total	1,266,366	378,672	777,453	−17,295	78,565	557,083
WESTERN EUROPE						
Austria	16,874	3,852	6,908	+178	8,676	1,095
Belgium and Luxembourg	—	50,493	—	−1,183	24,507	19,687
Denmark	—	38	—	−158	38,669	127
Finland	—	8,391	—	+641	11,715	3
France	14,229	230,416	6	−127	16,663	52,819
Germany, West	40,076	169,702	—	+5,168	27,044	20,238
Greece	—	12,752	—	−52	4,567	—
Iceland	—	—	—	—	2,795	—
Ireland	—	10,671	—	−228	3,388	809
Italy	13,545	216,977	3,529	+1,119	12,551	50,284
Netherlands	13,378	120,658	60	−3,543	37,214	85,186
Norway	—	1,513	—	+632	25,940	—
Portugal	—	9,654	−559	—	4,333	1,851
Spain	—	29,984	—	+78	2,468	1,415
Sweden	—	19,176	—	−1,034	77,679	967
Switzerland	—	—	—	—	28,439	32
United Kingdom	649	320,774	—	+149	112,921	68,453
Yugoslavia	6,671	(*E*) 3,970	—	+1,138	(*E*) 1,620	(*E*) 695
Sub-total	105,422	1,209,021	9,944	+2,778	441,189	303,661
MIDDLE EAST						
Aden	—	31,332	—	+308	12,385	16,955
Bahrain	16,500	59,599	—	+169	505	66,238
Iran	390,754	—	246,286	+2,379	—	93,401
Iraq	353,833	—	(*E*) 337,705	+930	(*E*) 13	—
Israel	930	(*E*) 9,795	—	—	(*E*) 10,776	121
Jordan	—	(*E*) 132	—	—	(*E*) 1,277	—
Kuwait	594,278	—	527,299	+2,036	10	32,308
Lebanon	—	5,422	—	—	(*E*) 361	—
Neutral Zone	49,829	—	(*E*) 39,241	−1,262	(*E*) 33	(*E*) 6,100
Qatar	63,088	—	62,424	+448	—	—
Saudi Arabia	456,453	—	372,929	+1,212	86	57,593
Turkey	2,624	—	—	+198	9,652	—
U.A.R., Syria	—	5,176	—	+95	1,297	—
Sub-total	1,928,289	111,456	1,585,884	6,513	36,395	272,716
AFRICA						
Algeria and French Sahara	67,408	—	63,438	+3,970	10,518	—
Angola	477	868	—	−33	761	306
Republic of the Congo	—	—	—	—	(*E*) 3,318	—
Canary Islands	—	21,577	—	+13	1,076	16,446
Ethiopia	—	—	—	—	(*E*) 935	—
States formerly in French Equatorial Africa	5,991	—	5,843	+148	(*E*) 2,136	—
States formerly in French West Africa	—	—	—	—	(*E*) 4,091	—
Ghana	—	—	—	—	(*E*) 3,562	—
Kenya	—	—	—	—	(*E*) 6,156	(*E*) 995
Liberia	—	—	—	—	(*E*) 386	—
Malagasy Republic	—	—	—	—	960	—
Morocco	695	992	—	+54	4,680	—
Nigeria	6,552	—	6,226	+326	5,813	—
Federation of Rhodesia and Nyasaland	—	—	—	—	(*E*) 4,118	—
Sierra Leone	—	—	—	—	2,268	—
The Sudan	—	—	—	—	3,320	—
Tanganyika	—	—	—	—	2,435	398
Tunisia	—	—	—	—	3,724	—
Uganda	—	—	—	—	1,201	204
Union of South Africa	—	9,716	—	−507	19,922	2,289
U.A.R., Egypt	23,968	15,382	(*E*) 4,124	+3,891	7,892	1,245
	105,091	48,535	79,631	8,942	89,272	21,883
SOUTH ASIA, FAR EAST, AND OCEANIA						
Australia	—	85,131	—	+1,159	11,610	12,815
British Borneo	34,005	—	18,882	—	(*E*) 951	(*E*) 14,889
Burma	4,078	—	—	+199	205	71
Ceylon	—	—	—	—	4,575	6
India	3,370	(*E*) 43,160	—	+1,740	(*E*) 17,017	(*E*) 1,983
Indonesia	152,988	9,556	80,528	+2,365	(*E*) 3,852	(*E*) 38,654
Japan	3,678	195,748	—	−2,794	38,323	3,846
Korea, South	—	—	—	—	4,969	—
Malaya and Singapore	—	(*E*) 2,310	(*E*) 1,927	+383	(*E*) 44,773	(*E*) 18,863
Netherlands New Guinea	1,538	—	1,538	—	Insig.	—
New Caledonia	—	—	—	—	(*E*) 408	—
New Zealand	—	—	—	—	13,346	—
Pakistan	2,636	—	—	+252	(*E*) 11,456	(*E*) 252
Philippines	—	10,474	—	+383	10,049	—
Taiwan	14	7,949	—	+276	139	104
Thailand	—	—	—	—	8,490	—
Vietnam, South (including Cambodia)	—	—	—	—	6,123	—
Sub-total	202,307	354,328	102,975	+3,963	176,286	91,483
TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., and MAINLAND CHINA	6,473,407	2,648,168	2,602,216	−8,579	1,197,364	1,341,845
(*E*) TOTAL SOVIET-SINO BLOC	1,210,340	7,300	60,590	+14,951	44	90,520
TOTAL WORLD	7,683,747	2,655,468	2,662,806	+6,372	1,197,408	1,432,365

(*E*) Estimate based on latest available data.

TABLE II
WORLD OUTPUT REFINED PRODUCTS, 1960*
(Thousands of barrels)

	Gasoline	*Kerosine and jet fuel*	*Distillate fuel oil*	*Residual fuel oil*	*Lubricants (incl. grease)*	*Other refined products*	*Refinery fuel and loss*	*Total output refined products*
NORTH AMERICA								
Canada	102,724	19,833	75,511	35,387	2,121	39,014	5,969	280,559
Mexico	27,804	10,999	13,026	37,172	1,082	4,982	12,213	107,278
United States (including Alaska and Hawaii)	1,510,134	224,020	667,050	332,147	59,389	326,587	(a)	3,119,327
Sub-total	1,640,662	254,852	755,587	404,706	62,592	370,583	18,182	3,507,164
CENTRAL AMERICA AND CARIBBEAN								
Costa Rica	—	—	—	—	—	—	—	—
(E) Cuba	6,031	1,008	4,384	10,351	—	659	601	23,034
Dominican Republic	—	—	—	—	—	—	—	—
El Salvador	—	—	—	—	—	—	—	—
Guatemala	—	—	—	—	—	—	—	—
Haiti	—	—	—	—	—	—	—	—
Honduras	—	—	—	—	—	—	—	—
Jamaica	—	—	—	—	—	—	—	—
Nicaragua	—	—	—	—	—	—	—	—
Panama, Canal Zone	—	—	—	—	—	—	—	—
Panama, Republic	—	—	—	—	—	—	—	—
Puerto Rico	10,698	2,110	4,046	9,644	—	1,002	1,640	29,140
Sub-total	16,729	3,118	8,430	19,995	—	1,661	2,241	52,174
SOUTH AMERICA								
Argentina	17,069	7,947	11,672	41,469	1,004	6,105	437	85,703
Bolivia	904	400	383	542	—	—	32	2,261
Brazil	22,113	3,419	9,909	23,575	24	4,784	2,659	66,483
British Guiana	—	—	—	—	—	—	—	—
Chile	4,771	1,106	1,904	2,142	—	319	622	10,864
Colombia	9,783	1,666	3,353	9,632	95	2,267	−234	26,562
Ecuador	1,730	300	693	1,206	—	202	113	4,244
Netherlands Antilles	39,353	20,587	40,291	145,605	2,367	14,980	16,070	279,253
Paraguay	—	—	—	—	—	—	—	—
Peru	4,952	3,996	5,062	2,454	48	252	84	16,748
Trinidad	12,106	6,957	13,374	44,431	—	4,640	833	82,341
Uruguay	2,063	1,492	1,483	4,166	—	122	143	9,489
Venezuela	37,956	12,585	52,712	194,779	1,693	20,469	9,911	330,105
Sub-total	152,820	60,355	140,836	470,001	5,231	54,140	30,670	914,053
WESTERN EUROPE								
Austria	2,393	307	4,521	5,443	551	410	546	14,171
Belgium and Luxembourg	11,882	1,979	13,986	15,911	201	3,909	4,349	52,217
(E) Denmark	—	—	52	—	—	124	20	196
(E) Finland	3,240	240	1,800	1,440	—	840	190	7,750
France	56,848	10,832	55,160	71,721	4,560	26,638	19,214	244,973
Germany, West	47,379	2,015	36,121	80,588	3,367	20,739	14,401	204,610
Greece	1,906	1,544	3,324	5,068	—	246	716	12,804
Iceland	—	—	—	—	—	—	—	—
Ireland	2,495	273	3,104	4,121	—	82	824	10,899
Italy	37,719	8,223	59,741	88,459	1,216	16,650	24,505	236,513
Netherlands	28,427	8,596	30,382	56,421	1,435	15,474	8,918	149,653
(E) Norway	158	—	192	100	176	243	12	881
Portugal	2,545	1,736	1,575	3,023	—	1,028	306	10,213
Spain	5,012	2,019	6,301	13,715	254	1,316	2,088	30,705
Sweden	2,864	1,161	4,015	9,261	114	1,447	1,348	20,210
Switzerland	—	—	—	—	—	—	—	—
United Kingdom	68,632	18,244	58,221	123,427	6,483	24,378	21,889	321,274
Yugoslavia	2,431	574	2,638	2,691	428	513	228	9,503
Sub-total	273,931	57,743	281,133	481,389	18,785	114,037	99,554	1,326,572
MIDDLE EAST								
Aden	3,315	2,502	6,133	15,169	—	2,048	1,857	31,024
Bahrain	14,329	9,321	16,870	29,620	—	1,266	4,725	76,131
(E) Iran	26,250	21,941	20,850	55,915	126	1,702	15,305	142,089
(E) Iraq	2,431	2,385	3,039	5,693	—	434	1,216	15,198
Israel	1,772	1,387	2,824	3,547	—	643	552	10,725
(E) Jordan	29	28	57	37	—	4	7	132
Kuwait	1,444	306	10,776	49,693	—	205	2,519	64,943
Lebanon	986	576	1,227	2,387	—	66	180	5,422
(E) Neutral Zone	—	—	—	10,250	—	1,200	400	11,850
(E) Qatar	72	24	72	24	—	—	24	216
Saudi Arabia	10,067	8,503	10,635	45,148	—	7,372	587	82,312
(E) Turkey	628	—	251	1,215	—	235	97	2,426
U.A.R., Syria	910	752	1,301	1,908	—	56	154	5,081
Sub-total	62,233	47,725	74,005	220,606	126	15,231	27,623	447,549
AFRICA								
Algeria and French Sahara	—	—	—	—	—	—	—	—
Angola	239	25	365	649	—	5	29	1,312
Republic of the Congo	—	—	—	—	—	—	—	—
Canary Islands	3,071	1,086	4,446	9,412	66	9,256	1,613	28,950
Ethiopia	—	—	—	—	—	—	—	—
States formerly in French Equatorial Africa	—	—	—	—	—	—	—	—
States formerly in French West Africa	—	—	—	—	—	—	—	—
Ghana	—	—	—	—	—	—	—	—
Kenya	—	—	—	—	—	—	—	—
Liberia	—	—	—	—	—	—	—	—
Malagasy Republic	—	—	—	—	—	—	—	—
Morocco	642	80	319	242	—	285	65	1,633
Nigeria	—	—	—	—	—	—	—	—
Federation of Rhodesia and Nyasaland	—	—	—	—	—	—	—	—
Sierra Leone	—	—	—	—	—	—	—	—
The Sudan	—	—	—	—	—	—	—	—
Tanganyika	—	—	—	—	—	—	—	—
Tunisia	—	—	—	—	—	—	—	—
Uganda	—	—	—	—	—	—	—	—

TABLE II
WORLD OUTPUT REFINED PRODUCTS, 1960*—(*continued*)
(Thousands of barrels)

	Gasoline	*Kerosine and jet fuel*	*Distillate fuel oil*	*Residual fuel oil*	*Lubricants (incl. grease)*	*Other refined products*	*Refinery fuel and loss*	*Total output refined products*
AFRICA—(*continued*)								
Union of South Africa	2,924	1,333	2,247	1,614	—	1,021	70	9,209
U.A.R., Egypt	2,354	2,873	4,125	18,554	—	843	2,586	31,335
Sub-total	9,230	5,397	11,502	30,471	66	11,410	4,363	72,439
SOUTH ASIA, FAR EAST, AND OCEANIA								
Australia	31,963	3,352	19,950	21,341	208	7,027	2,889	86,630
(*E*) British Borneo	4,083	—	6,079	3,357	—	635	969	15,123
Burma	1,295	824	780	768	—	96	116	3,879
Ceylon	—	—	—	—	—	—	—	—
(*E*) India	9,307	7,794	12,023	10,552	10	3,187	1,917	44,790
(*E*) Indonesia	12,774	13,284	16,506	17,039	—	20,489	6,664	86,756
Japan	38,491	15,584	22,516	97,392	4,038	16,111	13,751	207,883
Korea, South	—	—	—	—	—	—	—	—
Malaya and Singapore	—	—	—	—	—	—	—	—
Netherlands New Guinea	—	—	—	—	—	—	—	—
New Caledonia	—	—	—	—	—	—	—	—
New Zealand	—	—	—	—	—	—	—	—
Pakistan	731	140	512	693	56	181	71	2,384
Philippines	3,585	666	1,896	2,894	—	462	588	10,091
Taiwan	1,877	1,286	1,300	2,592	—	288	344	7,687
Thailand	—	—	—	—	—	—	—	—
Vietnam, South (including Cambodia)	—	—	—	—	—	—	—	—
Sub-total	104,106	42,930	81,562	156,528	4,312	48,476	27,309	465,223
WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., AND MAINLAND CHINA	2,259,711	472,120	1,353,055	1,783,696	91,112	615,538	209,942	6,785,174

* Excludes liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
(*E*) Data presented are estimates based on latest available data.
(*a*) Refinery fuel and loss in the United States data are included in residual fuel and other.

TABLE III
DOMESTIC DEMAND REFINED PRODUCTS, BY COUNTRIES, 1960*
(Thousands of barrels)

Country	*Gasoline (total incl. motor and aviation)*	*Kerosine and jet fuel*	*Distillate fuel oil*	*Residual fuel oil*	*Lubricants (including grease)*	*Other refined products*	*Refinery fuel and loss*	*Total refined products*
NORTH AMERICA								
(*a*) Canada	105,410	21,528	87,669	58,911	3,346	23,781	5,969	306,614
Mexico	31,254	11,153	13,477	31,291	1,237	8,101	12,213	108,726
(*a*) United States (including Alaska and Hawaii)	1,517,407	235,588	685,976	560,330	42,667	499,790	(*b*) —	3,541,758
Sub-total	1,654,071	268,269	787,122	650,532	47,250	531,672	(*b*) 18,182	3,957,098
CENTRAL AMERICA AND CARIBBEAN								
Costa Rica	395	59	381	129	33	37	—	1,034
Cuba	6,681	1,174	4,548	13,567	290	721	601	27,582
Dominican Republic	813	130	474	1,232	52	134	—	2,835
El Salvador	658	206	245	400	23	56	—	1,588
Guatemala	933	207	417	1,243	33	88	—	2,921
Haiti	187	10	223	182	17	1	—	620
Honduras	325	84	540	483	43	20	—	1,495
Jamaica	775	352	955	3,311	29	1	—	5,423
Nicaragua	573	128	281	400	22	14	—	1,418
Panama, Canal Zone	281	71	2,250	3,431	14	4	—	6,051
Panama, Republic	1,214	224	286	1,028	22	—	—	2,774
Puerto Rico	5,763	2,274	913	6,648	101	3,981	1,640	21,320
Sub-total	18,598	4,919	11,513	32,054	697	5,057	2,241	75,061
SOUTH AMERICA								
(*a*) Argentina	17,202	11,442	15,542	39,232	1,276	3,876	437	89,007
(*a*) Bolivia	952	333	370	487	16	29	32	2,219
Brazil	29,611	4,381	18,293	34,927	1,620	5,076	2,659	96,567
British Guiana	222	125	428	866	30	1	—	1,672
(*a*) Chile	4,884	1,672	2,227	7,180	230	725	622	17,540
(*a*) Colombia	9,593	1,600	3,096	4,925	274	899	234	20,153
Ecuador	1,818	301	701	1,206	51	302	113	4,492
(*c*) Netherlands Antilles	7,535	2,856	11,934	20,389	225	8,861	16,070	61,708
(*a*) Paraguay	260	123	111	164	14	1	—	673
Peru	5,040	3,244	3,421	5,511	170	299	84	17,769
(*a*) (*d*) Trinidad	894	298	3,482	11,430	46	390	833	17,373
Uruguay	2,152	1,492	1,913	5,313	136	122	143	11,271
(*a*) Venezuela	15,391	3,703	7,346	18,649	233	1,360	9,911	56,593
Sub-total	95,554	25,858	68,864	150,279	3,871	21,941	30,670	397,037
WESTERN EUROPE								
(*a*) Austria	5,121	119	3,967	9,633	723	781	546	20,890
(*a*) Belgium and Luxembourg	11,145	640	14,280	15,341	806	3,674	4,349	50,235
Denmark	8,597	1,987	11,950	14,247	421	1,516	20	38,738
Finland	3,632	490	12,553	1,440	317	840	190	19,462
(*a*) France	48,462	3,223	46,794	64,843	3,695	17,912	19,214	204,143
(*a*) Germany, West	52,621	1,418	39,575	103,603	4,550	12,893	14,401	229,061
Greece	2,025	1,575	4,887	7,767	142	259	716	17,371
Iceland	483	68	1,369	875	—	—	—	2,795
Ireland	2,633	1,036	3,139	5,067	162	617	824	13,478
(*a*) Italy	23,966	3,878	22,527	83,950	1,831	3,907	24,505	164,564
Netherlands	8,305	5,457	19,065	45,471	834	13,631	8,918	101,681
Norway	4,055	1,561	9,584	9,876	448	1,285	12	26,821
Portugal	1,927	1,987	3,310	3,846	197	1,122	306	12,695
(*a*) (*E*) Spain	7,105	2,963	7,461	13,695	659	—	2,088	33,971
Sweden	16,022	3,966	34,556	38,486	1,072	1,472	1,348	96,922

TABLE III
DOMESTIC DEMAND REFINED PRODUCTS, BY COUNTRIES, 1960*—*(continued)*
(Thousands of barrels)

Country	Gasoline (total incl. motor and aviation)	Kerosine and jet fuel	Distillate fuel oil	Residual fuel oil	Lubricants (including grease)	Other refined products	Refinery fuel and loss	Total refined products
WESTERN EUROPE—*(continued)*								
Switzerland	8,504	121	2,799	15,689	410	884	—	28,407
(a) United Kingdom	78,029	18,812	52,318	140,259	6,859	26,072	21,889	344,238
Yugoslavia	2,401	597	3,558	2,591	481	572	228	10,428
Sub-total	285,033	49,898	293,692	576,679	23,607	87,437	99,554	1,415,900
MIDDLE EAST								
(c) Aden	−2,153	224	4,575	19,891	12	2,048	1,857	26,454
(c) Bahrain	406	154	1,076	3,623	7	407	4,725	10,398
(a) Iran	3,935	6,137	7,082	11,700	95	1,706	15,305	45,960
Iraq	2,431	2,385	3,039	5,693	13	434	1,216	15,211
Israel	3,404	2,611	4,756	9,151	84	822	552	21,380
Jordan	392	325	576	81	24	4	7	1,409
(c) Kuwait	1,400	306	4,840	23,365	10	205	2,519	32,645
(a) Lebanon	1,896	324	1,226	2,798	24	—	180	6,448
Neutral Zone	30	—	—	5,350	3	—	400	5,783
(a) Qatar	143	43	157	—	—	—	24	367
(a) (c) Saudi Arabia	1,899	549	1,626	12,938	32	7,269	587	24,900
Turkey	3,718	2,274	4,129	1,215	322	323	97	12,078
U.A.R., Syria	981	787	2,392	1,908	84	72	154	6,378
Sub-total	18,482	16,119	35,474	97,713	710	13,290	27,623	209,411
AFRICA								
Algeria and French Sahara	3,102	802	3,394	2,980	240	—	—	10,518
Angola	440	104	658	478	53	5	29	1,767
Republic of the Congo	1,536	306	1,026	180	122	148	—	3,318
Canary Islands	−36	−23	1,494	3,472	1	7,059	1,613	13,580
Ethiopia	711	31	—	152	41	—	—	935
States formerly in French Equatorial Africa	1,140	240	648	—	72	36	—	2,136
States formerly in French West Africa	2,200	520	675	540	120	36	—	4,091
Ghana	1,250	408	1,249	445	90	120	—	3,562
Kenya	1,022	501	2,569	1,000	69	—	—	5,161
Liberia	149	100	130	—	7	—	—	386
Malagasy Republic	490	136	298	—	36	—	—	960
(a) Morocco	2,128	418	1,687	1,972	120	285	65	6,675
Nigeria	2,429	994	1,601	404	132	253	—	5,813
Federation of Rhodesia and Nyasaland	2,232	303	1,232	12	161	178	—	4,118
Sierra Leone	142	90	943	1,067	16	10	—	2,268
The Sudan	755	456	679	1,349	64	17	—	3,320
Tanganyika	583	91	1,313	—	50	—	—	2,037
(a) Tunisia	664	356	902	1,407	63	173	—	3,565
Uganda	508	184	275	—	30	—	—	997
Union of South Africa	13,053	4,342	6,201	1,218	972	986	70	26,842
U.A.R., Egypt	1,754	6,096	5,755	20,673	284	834	2,586	37,982
Sub-total	36,252	16,455	32,729	37,349	2,743	10,140	4,363	140,031
SOUTH ASIA, FAR EAST, AND OCEANIA								
(a) Australia	36,884	5,583	13,209	18,084	1,653	2,330	2,889	80,632
British Borneo	1,436	108	−2,453	438	27	660	969	1,185
Burma	1,361	824	780	799	101	32	116	3,013
Ceylon	1,438	1,159	1,413	333	108	118	—	4,569
India	8,093	15,964	17,548	10,887	2,298	3,117	1,917	59,824
(a) Indonesia	6,695	9,188	5,503	6,512	232	480	6,664	35,274
Japan	37,076	15,383	31,217	121,847	5,068	18,018	13,751	242,360
Korea, South	1,048	250	3,325	71	106	169	—	4,969
Malaya and Singapore	2,154	1,857	7,684	13,668	232	315	—	25,910
Netherlands New Guinea	—	—	—	—	—	—	—	Insig.
New Caledonia	132	24	84	156	12	—	—	408
New Zealand	7,498	398	5,099	—	341	10	—	13,346
Pakistan	1,491	1,958	3,536	5,711	640	181	71	13,588
Philippines	7,139	1,974	4,514	4,662	401	862	588	20,140
Taiwan	1,877	1,286	1,300	2,596	120	199	344	7,722
Thailand	3,390	1,041	2,859	786	237	177	—	8,490
Vietnam, South (including Cambodia)	2,288	769	1,559	1,177	143	187	—	6,123
Sub-total	120,000	57,766	97,177	187,727	11,719	26,855	27,309	528,553
WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., and MAINLAND CHINA	2,227,990	439,284	1,326,571	1,732,333	90,579	696,392	(b)209,942	6,723,091

* Unless otherwise specified, data represent apparent domestic demand (including inland demand, refinery fuel and loss, and bunkers). Apparent domestic demand is derived from the components of refined product output, plus imports, minus exports, with no allowance for changes in stocks. If any one of these components is estimated, apparent domestic demand is also estimated.

(a) Domestic demand as reported, including refinery fuel and loss, stock changes, and bunkers; also includes, where available, liquefied petroleum gases sold direct for fuel and chemical uses from natural gasoline plants.
(b) Refinery fuel and loss in the United States data are included in residual fuel and other.
(c) Apparent domestic demand is heavily influenced by refinery fuel and loss, and bunker loadings.
(d) Based on reported demand for first six months.
(E) Estimate based on latest available data.

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RESEARCH GRANTS

The Chemical Society has announced that applications for grants for the assistance of research in all branches of chemistry will be considered in November next and should be submitted not later than 15 November.

Application forms, together with details of regulations governing the award of grants, are available from The General Secretary of The Chemical Society, Burlington House, Piccadilly, London, W.1.

BEAMA ELECTRONICS BOARD

The BEAMA Council has established an Electronics Board to represent its members directly concerned with electronic engineering.

This new board will act for the BEAMA Council on matters of broad policy in this field and it will provide the necessary high level liaison with government departments and other associations on policy matters affecting the electronics industry.

TABLE IV
BUNKER OIL DELIVERIES TO VESSELS ENGAGED IN INTERNATIONAL TRADE 1960
ALL FLAGS AS REPORTED
(Thousands of barrels)

Country	Distillate fuel oil	Residual fuel oil
Canada	1,095 E	5,475 E
U.S.A.	10,723	68,136
Jamaica	361	839
Panama, Canal Zone	3,101	2,347
Argentina	337	1,108
Colombia	470	730
Netherlands Antilles	4,432 (a)	17,656
Peru	53	209
Trinidad	2,964 (a)	10,859
Uruguay	446 (a)	1,379
Venezuela	2,390 (a)	14,775
Belgium and Luxembourg	574	3,745
Denmark	991	710
France	2,671	9,054
W. Germany	4,767	11,162
Italy	4,158	13,152
Netherlands	2,671	7,029
Portugal	1,642	1,356
Spain	1,353 E	690 E
Sweden	1,604 E	1,352 E
United Kingdom	5,905	22,214
Aden	5,446	20,990
Bahrain	691	3,719
Iran	1,728 E	4,448 E
Israel	120 E	240 E
Kuwait	—	22,719
Lebanon	846 (a)	1,022
Neutral Zone	—	2,900 E
Saudi Arabia	720	12,000
Algeria and French Sahara	1,379 E	2,392 E
Canary Islands	1,830	3,353
West Africa	2,808 E	5,112 E
Kenya	167 E	740 E
Liberia	17 E	23 E
Morocco	150 E	380 E
Sierra Leone	1,041 E	480 E
Union of South Africa	744 E	2,976 E
U.A.R., Egypt	23	155
Australia	1,834	7,588
Ceylon	478 (a)	2,725
India	300 E	3,100 E
Indonesia	435 E	1,681 E
Japan	2,767	24,004
New Zealand	490 E	1,067 E
Philippines	17	150
Thailand	402	16
S. Vietnam (incl. Cambodia)	15	59

(E) Based on latest available data
(a) Includes other, such as aviation gasoline and lubricants

LADIES EVENING

It has been suggested that the wives of Members might welcome an opportunity to look over the home of the Institute, with its considerable architectural merits, and the place where the meetings of the Institute are held.

To this effect an invited "at home" is being held on 20 October 1961, when members and their wives will be able to avail themselves of the opportunity of looking around the Institute building, having tea, and attending a lecture on a subject that will appeal to ladies. The lecture will be a general semi-technical one on "Petroleum Products in Cosmetics", and will be given by T. A. Brock of Max Factor Ltd.

The Social Evening will commence with tea at 4.30–6 p.m., and guests will be able to look over the Institute during that time.

Owing to the limited size of the lecture hall, admission will be by ticket only. Each ticket will be a joint one to admit a member and a lady guest. It is stressed that *invitations are not for male members alone*. Admittance will be limited to 100 couples, and applications for the joint tickets should be addressed to the General Secretary of the Institute without delay.

API Honours Late Dr S. F. Birch

The American Petroleum Institute recently honoured the memory of the late Dr S. F. Birch, Research Associate of The British Petroleum Co. Ltd, who died in March 1960. Bound copies of a memorial recording Dr Birch's outstanding contributions to the chemistry of petroleum were presented to his widow, Mrs H. M. Birch, and to M. A. L. Banks, a managing director of BP, at a ceremony which took place at the BP Research Centre at Sunbury-on-Thames recently.

The presentation was made by W. D. Seyfried, manager, Research, of the Humble Oil and Refining Company.

The memorial expresses the gratitude that all associated with API Research Project 48, concerned with sulphur chemistry, felt towards Dr Birch and their appreciation of his outstanding career. It observes that as early as 1925 Dr Birch recognized the importance of sulphur compounds and that knowledge of these would lead to a more complete understanding of the composition and characteristics of petroleum and its mode of formation. The experience he had acquired in this field and the methods he had developed were an important contribution to the success of the project.

The memorial also mentions Dr Birch's interest in the introduction of gas liquid chromatography into petroleum research, and his discussion of this technique with Project 48 at an early stage in its development. Dr Birch was also distinguished in other fields of petroleum research, outstanding among them being alkylation, superfractionation for aviation gasoline, separation of aromatics, and petroleum chemicals.

Mrs H. M. Birch receiving the Memorial Address to her late husband from W. D. Seyfried of the Humble Oil and Refining Company

Notes of the Month

Promise of Big New Oilfield in Bolivia

With the completion of two producing wells in a new shallow pay on the Caranda structure, near Santa Cruz in Bolivia, Gulf Oil Corporation believes it may have opened a multi-pay field that could develop into one of major proportions.

The wells are Caranda-3A, which was completed from perforations between 3410 ft and 3488 ft, and Caranda-4, completed from perforations between 3573 ft and 3593 ft. Both wells flowed at rates of better than 1000 bd of clean 52 gravity oil on test on ½-in choke. Production is from the Petaca formation of Tertiary age.

Caranda-3A is a twin to No 3, which earlier this year flowed on a ½-in choke at rates up to 1570 bd on drillstem test but was later suspended because of mechanical difficulties. Caranda-3A is approximately a mile northwest of the first well, the field discovery well which was completed late last year from a thin Permo-Carboniferous sand at 5800 ft. No 4 is 1 mile west of 3A and almost 2 miles northwest of the discovery well. Another well, slightly more than half a mile north of No 1, was completed early this year at 6200 ft in a sand thought to be the same pay as the discovery well.

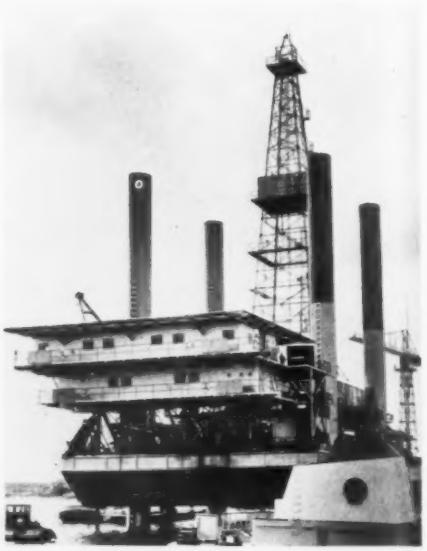
Studies are now being made for a pipeline outlet to the Pacific West Coast through Arica, Chile.

Drilling in the North Sea

The Tyne-built oil drilling platform *Triton* is now in position and ready to start the first-ever offshore drilling operations in the North Sea. The site is 2½ miles off the coast of South Holland, roughly halfway between the beach of Scheveningen and The Hook.

The operating company is N.V. Nederlandse Aardolie Maatschappij, which is jointly owned by Bataafse Petroleum Maatschappij N.V. and Standard Oil Company (New Jersey). The location is known as "Kijkduin Zee A", and the first well will have a scheduled depth of 6500 ft, which is expected to be reached in about 4 weeks of drilling time.

LOCATION OF N.A.M. OFFSHORE DRILLING IN NORTH SEA



This cleverly photographed view gives an excellent impression of the size of the Triton. *Shortly after the photograph was taken, the platform was towed to the drilling site 2½ miles off the coast of South Holland, a journey which took some* 10 *hours. The Royal Netherlands Meteorological Institute is keeping the operating company informed of weather conditions, and the moment rough seas threaten, the crew will be flown to the shore. Good weather will be essential, therefore, if the target depth of* 6500 *ft is to be reached in the scheduled four weeks*

The 2400-ton *Triton* was built in Wallsend-on-Tyne, and was originally designed for use in shallow waters in the Western Hemisphere. For its work in the North Sea, however, it has been considerably reinforced. Four new legs, each with a length of 170 ft and a diameter of 8 ft, have been fitted, and will support the platform about 50 ft above sea level.

A continuous helicopter airbridge and radio telephone facilities will maintain constant contact with shore. A stand-by ship will be permanently stationed near the platform, which will be floodlit at night. Foghorns and extensive firefighting equipment form part of a stringent safety programme.

Four 160 hp Rolls-Royce diesel generators will supply the platform's electrical current, and a d c diesel system, developed by a Dutch engineering firm in conjunction with Royal Dutch Shell technologists, will power the actual drilling rig.

Two crews will be on board simultaneously. The platform's total complement will number 38, including a male nurse and six catering staff. The men will be accommodated two, three, or four to a cabin, and they will enjoy the benefits of air-conditioning and central heating.

Current production of crude from oilfields in the Netherlands is almost 2 million tons year, which is equal to about a quarter of the total inland consumption of oil products.

Drilling Report from Iran

The latest news of drilling progress in Iran at the time this issue went to press was that, NIOC's Alborz-9 and Yort-e-Shah-1 had reached depths of 7717 ft and 2443 ft. At Sarajeh-5, the rig was being dismantled after drilling to 8992 ft.

IPAC's offshore wells D-1 and C-1 were drilling at depths of 6709 and 6919 ft, while SIRIP's offshore wells 1 and 2 were undergoing production tests. SIRIP's offshore-4 was drilling at 590 ft, and at Sequtah in the Zagros Mountains drilling had reached 11,457 ft, with the last casing at 9639 ft.

The Iranian Oil Exploration and Production Company recently started drilling operations at Quishm Island in the Persian Gulf. This is the second island on which exploration activities will have been carried out, the other one being Sheikh Shouab Island.

The new drilling project involves the construction of a 2-mile road from the beach to the site of the operations. The equipment for this work arrived on the Island in mid-July, and prior to this had been used on Sheikh Shouab Island.

The history of exploration on Quishm Island goes back to 1916, when the former Anglo-Iranian Oil Co. drilled a well to a depth of 3315 ft near the site of the current operations. The same company drilled another well to a depth of 8284 ft at the same site in 1933. Although both wells encountered gas, no oil was found.

The present well is expected to reach a depth of up to 15,000 ft.

Dredging the Belfast Lough

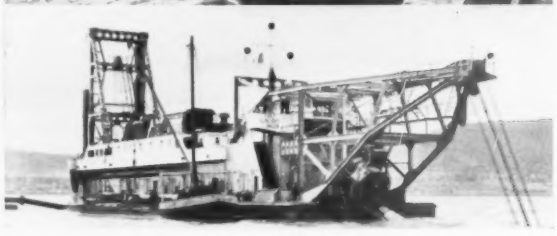
Activities are commencing in Belfast Lough which will eventually culminate in the coming "on stream" of the new refinery for The British Petroleum Company to be constructed at Sydenham on the eastern shore of the Lough.

To enable crude oil to be brought to the refinery in large tankers, the Belfast Harbour Commissioners are deepening the Harbour approaches.

Action started with the arrival of the cutter head suction dredger *Port Sunlight* which is owned and operated by the Westminster Dredging Company and will be engaged in deepening the Victoria Channel and dredging the area for the head of the new crude oil jetty. The *Port Sunlight* is stated to be the most powerful rotary cutting suction dredger ever built in Europe and was constructed at Bromborough Dock on the Mersey. The cutter incorporated on the vessel is 8 feet in diameter, and power to drive it is provided by a submersible type electric motor of 1250 hp.

Dredged materials will be pumped ashore directly from the vessel by means of a floating pipeline, the buoyancy being provided by pontoons attached to the pipes. The first material to be pumped ashore will be the overlaying silt which will be led away from the refinery site. This will be followed by sand which will be used to blanket the refinery site to an average depth of three feet. It is anticipated that this operation will be completed by the end of 1961, following which the construction of the refinery will commence. Its initial crude capacity will be 1,300,000 tons year.

These pictures show the floating pipeline, through which the dredged materials will be pumped ashore, and the dredger which is carrying out the work



Lobitos Refinery Developments

The 5000 bd combination atmospheric vacuum crude distillation unit now being built at the Ellesmere Port refinery of Lobitos Oilfields Ltd is expected to go on stream in November.

A view of the current building operations at the Lobitos refinery

The unit replaces one of the refinery's original units, which started up in 1934. It is designed to process a variety of crudes, with the emphasis on Peruvian sweet feedstock, and will produce a straight-run gasoline, white spirit, gas oil, lube stocks, and asphalts.

The current expansion programme at the refinery includes a new building for the final processing (*i.e.* dehydration) and loading of transformer oil, a cooling tower, additional boiling plant, electrical services, stores, workshops, new loading bays for diesel fuel, and a new library.

Erection of the new distillation unit is being carried out by Kellogg International Corporation. Linked with this project, expansion has also been necessary in solvent extraction, acid treatment and clay treatment capacity, and in storage of crude, intermediate, and finished products.

Opening of Solartron's New Farnborough H.Q.

Several hundred people travelled to Farnborough in Hampshire recently to see the President of the Board of Trade, The Rt Hon Reginald Maudling, open the main building of the Solartron Electronic Group's headquarters.

The building consists of an attractive four-storey block providing 35,000 sq ft of accommodation for administrative, research, and development staffs, plus a further 70,000 sq ft of production floor space.

The opening of the building completed the second phase of a 5-year building programme. Phase 1, which included 50,000 sq ft of workshop area and a one-story administrative building, was completed 3 years ago. The Group's future plans for the Farnborough site provide for existing factory space to be doubled by 1966.

The rapid expansion reflects not only the tremendous rate of growth of the electronics industry as a whole, but also Solartron's enterprise in the export market. The Group's chairman and managing director, John E. Bolton, who introduced the President of the Board of Trade, disclosed in his speech that some 40 per cent of all orders received by the Farnborough Division in the last 6 months were direct export orders.

A visual example of the Group's go-getting salesmanship in the export market was provided for visitors to the opening ceremony by a travel-stained demonstration vehicle which had just returned from the Poznan Fair and Budapest Exhibition. It had travelled some 2035 miles and brought back firm orders worth £26,000 with a possible £176,000 worth of orders still under negotiation.

New Houses Have "Built-in-Warmth"

A new residential estate being built near Tonbridge, Kent, is believed to be the first in Britain to incorporate houses having an integrated heating and insulating scheme.

The houses have double-glazed downstairs windows, 4-in *Thermalite* lightweight concrete insulating blocks in the inner skin of the cavity walls, and a 2-in quilt of *Fibreglass* in the attic is claimed to reduce heat loss through the roof by 75 per cent.

The extra cost of insulating each of these four-bedroomed houses costing £7900 is £135. Compared with the traditional type of construction, it is estimated that heat losses will be reduced by up to 270 therms year, which, at 1*s* 6*d* a therm, would save more than £20 a year. Because of the insulation, a smaller capacity heating system is adequate to maintain the required temperature, and this results in a further saving of £80. It is possible, therefore, to save the whole of the extra cost in under 3 years.

The houses have an *Aga* heating system, using a 50,000 Btu/hr oil-fired boiler. Main living spaces are heated by water heated three-speed thermostat-controlled fans, while other rooms are heated by manually controlled radiators.

The scheme has been named "Built-in-Warmth" by the builders, Gower Builders (London) Ltd.

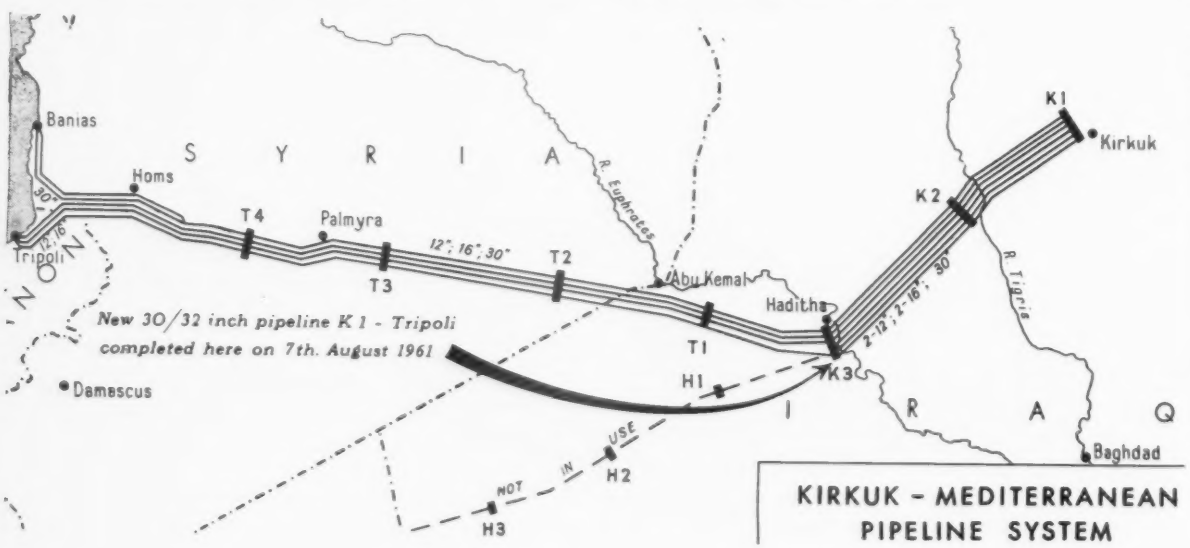
New Kirkuk–Tripoli Pipeline Completed

The new 30–32-in pipeline from K.1 pumping station Iraq, to the Mediterranean terminal at Tripoli is now complete.

The installation by the Iraq Petroleum Co. of looplines paralleling the line resulted in throughput in northern Iraq being increased to a rate of 37·6 million tons/year in October 1960. The final section of loops was that being built between K.3 and T.1 pumping stations. This is now complete and the last link in this new 530-mile line was joined at a point near K.3 on 7 August, with the result that for practical purposes the line is now serviceable.

The existing pumping stations on the pipeline are being modernized to handle the new extensions and new plant was ordered earlier this year for K.1, K.3, T.2, and T.4 stations. Gas turbines will operate on natural gas from the Kirkuk field.

When the reconstruction of these pumping stations is complete the capacity of the Kirkuk–Mediterranean system will be raised to 48 million tons/year.



Australian Oil Search

A recent report from the Australian News and Information Bureau included details of results of a 7-day production test of an oil and gas show around 10,000 ft at Cabawin No 1 in Queensland. The well, which reached basement at 12,035 ft, was drilled by Union Oil Development Corporation, Kern Land Company, and Australian Oil and Gas Corporation Ltd.

The results of the test were as follows:

Barrels/day	*Gravity °A.P.I.*	*Choke (inches)*	*Tubing Pressure (psi)*	*Casing Pressure (psi)*	*Gas*
85	51	24/64	600–900	1010–1575	630
81	51	28/64	500	810	682
78	48	32/64	425	775	616
76	48	45/64	100	350	682
71	48	45/64	100	350	642
62	50	20/64	1025	1475	436
63	51	20/64	1200	1700	386

Combarngo No 1, located 30 miles south-east of Roma, in Queensland was spudded-in on 5 May. A drill stem test of the interval between 5074 ft and 5019 ft produced mainly water with approximately 100,000 cu ft/day of petroliferous gas and a few barrels of high A.P.I. gravity oil. This well is being drilled by The Associated Australian Oilfields N.L., Associated Freney Oil Fields N.L., and the Papuan Apinaipi Petroleum Co. Ltd, and at the end of May had passed 5185 ft.

Also in Queensland, Phillips Petroleum Company and Sunray Mid-Continent Oil Company have spudded-in Buckabie No 1, located about 30 miles north of Quilpie. At the time of the latest report the well had reached a depth of over 5000 ft.

News from the other parts of Australia is summarized below:

New South Wales

At Baulkham Hills No 1, being drilled by the Australian Oil and Gas Corporation Ltd, small shows of gas were reported at 3117, 3125, and 3173 ft.

At Terrigal, Central Coast Oils Ltd last reported depth drilled at Terrigal No 1 well at 1995 ft, while at Clarence River Basin Oil Exploration Co. N.L.'s well, Clifden No 2, near Grafton, a medium flow of gas at 509 ft showed 96 per cent methane. Gas traces were encountered at 546, 570, and 576 ft.

Victoria

Drilling ceased at Port Campbell No 3 well, drilled by Frome-Broken Hill Co. Pty Ltd, at 5530 ft. Electric logs were run and 5½-in casing set at 5080 ft. Formation tests of a sandstone horizon at 4956–4963 ft showed that gas was present in appreciable, but not economic, quantities. Salt water was also present. Higher sandstones contained gas-saturated salt water only. The Company is now drilling at Flaxman's Hill No 1, located about 8 miles north-west of Peterborough, the last reported depth being 4126 ft.

South Australia

The joint Oil Development N.L.—General Exploration Co. of Australia well, Penola No 1, was abandoned at 4985 ft.

Western Australia

West Australian Petroleum Ltd completed seismic work in the Cashen Well area, near Routh Range No 1, and a marine seismic survey of approximately 350 miles of line is to be carried out in parts of Exmouth Gulf and adjacent waters. The Company is also to undertake seismic surveys in the Canning and Carnarvon Basins.

U.K. OIL CONSUMPTION ROSE BY 9·2 PER CENT IN FIRST HALF YEAR

Figures published by the Petroleum Information Bureau show that over the first six months of 1961 total consumption of oil products in the U.K. reached 23,171,887 tons, 9·2 per cent more than in the comparable period of 1960.

The rate of increase for black oils has moderated somewhat following the imposition of the tax of 2d. per gallon (some £2 per ton) in the Budget on 17 April. Fuel oil consumption, excluding refinery use, was 9·7 per cent up at 9,717,578 tons and gas/diesel oil deliveries totalled 2,009,621 tons, an advance of 13·7 per cent. Total consumption of "black oils", including refinery consumption, was 13,458,624 tons, an increase of 9·7 per cent, and 58 per cent of all oils consumed.

Motor spirit deliveries advanced by 8 per cent to 3,927,694 tons. Within this total, the trends of recent years continue. Deliveries to dealers were 10·7 per cent up and those to commercial consumers were down by 2·8 per cent; deliveries of premier grades were 15·8 per cent up and standard grades 6·6 per cent down. To offset the decline in deliveries to commercial consumers, however, derv fuel consumption (used largely in public service vehicles and in heavy goods vehicles) increased by 10·7 per cent to 1,386,022 tons.

Consumption of aviation fuels exceeded one million tons over the half year, the rate of advance being 25·1 per cent, reflecting the demands of large jet aircraft.

U.K. Deliveries into Inland Consumption of Petroleum Products

Product	*January–June*	
	1960	1961
	tons	*tons*
Aviation fuels	804,497	1,006,818
Motor spirit (including motor benzole) ...	3,636,905	3,927,694
Industrial spirits (including industrial benzole)	114,242	107,759
White spirit	80,321	77,625
Kerosine:		
Burning oil	715,855	658,605
Vaporizing oil	162,743	147,096
Total kerosine ...	878,598	805,701
Derv fuel	1,251,816	1,386,022
Gas, diesel, and fuel oils:		
Gas/diesel oil	1,767,923	2,009,621
Fuel oil	8,860,106	9,717,578
Total gas, diesel, and fuel oils (excluding refinery consumption)	10,628,029	11,727,199
Refinery consumption	1,637,466	1,731,425
Total gas, diesel and fuel oils (including refinery consumption) ...	12,265,495	13,458,624
Lubricating oils and greases	486,767	495,525
Paraffin wax and scale ...	27,021	26,146
Propane and butane ...	72,495	99,302
Bitumen	533,727	601,400
Chemical feedstock ...	764,939	795,227
Light distillate feedstock	189,362	252,411
Refinery gases	118,927	131,633
	21,225,112	23,171,887

Personal Notes

C. M. Vignoles

It was with deep regret that we learnt of the death of **C. M. Vignoles,** C.B.E., M.A., M.Inst. Pet., Immediate Past President of the Institute, on 23 September, whilst on holiday in Italy.

As recently as last June Mr Vignoles retired from the managing directorship of Shell-Mex and B.P. Ltd, a position he had held since 1951, after 37 years in the oil industry. Mr Vignoles joined the Asiatic Petroleum Company in Malaya in 1924. He stayed there for eight years, returning to London in 1932 to work in the Fuel Oil Department of the Shell Petroleum Company, where he remained until 1940 when he became the company's representative on the Overseas Supply Committee of the Petroleum Board. Later Mr Vignoles became joint executive secretary of the Committee, and was vitally concerned with the organization of the nation's wartime oil supplies. He was awarded the O.B.E. in 1946.

Between 1946 and 1950 he was eastern area manager of the Shell Group. At the end of 1950 he was elected to the Board of Shell-Mex and B.P. Ltd, and in March 1951 became managing director.

At the time of the Suez Canal crisis in 1956 he became chairman of the Oil Industry Emergency Committee. He was awarded the C.B.E. in 1957. He served as President of the Institute of Petroleum in 1958-60, and was a member of the Council of the Institute of Directors.

Sir Hubert Heath Eves

Sir Hubert Heath Eves, whose death occurred recently, was deputy chairman of Anglo-Iranian Oil Company from 1941 until his retirement in 1950. He joined the Burmah Oil Company in 1909, and was, for some time, B.O.C.'s agent in the Burma oilfields in charge of drilling and producing operations. Subsequently he became general manager in India. In 1914 he was appointed general manager of the Anglo-Persian Oil Company in India, returning to London in 1921 to take a controlling position in the Company's Distribution Department, helping to build up the BP marketing organization in the U.K. He became a director of the Company in 1924.

During the war he was appointed chairman of the Petroleum Board's Tanker Tonnage Committee, which operated the pooled British Tanker fleet under the Ministry of War Transport. He received his Knighthood as a result of this service in 1946.

Sydney Tindale, A.C.I.S., M.Inst. Pet., has been appointed a Director – Marketing, of National Benzole Company Ltd. Mr Tindale has spent nearly all his business life in the motor benzole industry, beginning his career as a commercial apprentice with Priestman Collieries Ltd. Shortly afterwards he moved to the marketing side of their associate company, the Newcastle Benzol Company. He later became assistant to the general manager of Newcastle Benzol and joined the National Benzole Company in 1928 after they had acquired the assets of the Newcastle Benzol Company.

After serving with the Petroleum Board, Mr Tindale was appointed manager of National Benzole's Northern Division at Newcastle-upon-Tyne in 1948, and, in 1953, he was transferred to the Company's headquarters as assistant sales manager. Since then, he has held a number of senior executive posts in London and was appointed general manager – marketing in January of this year.

M. J. Baker who is the new sales manager of The Power Petroleum Co. Ltd has been group manager at the Company's London head office since 1953. He joined Power Petroleum as a representative in 1926, and became district sales manager in Bristol and South Wales in 1929. Following war service, he served as assistant regional manager, Petroleum Board, Midlands Area, until his return to the Company as branch manager, Birmingham, where he served until his appointment as group manager.

M. J. Baker

P. I. Brewer, B.Sc. (Special), F.R.I.C. has been selected for an Esso Fellowship award by Esso Research Ltd and is attending a Post Graduate Course in High Polymer Chemistry at the Bradford Institute of Technology.

Mr Brewer has been with the Company for eight years, during most of the time connected with analytical chemistry. His recent work has included separation techniques using liquid phase chromatography.

P. I. Brewer

Following the news of his appointment as assistant managing director of Castrol Ltd, which is to take effect on 1 January 1962, it has been announced that **J. A. V. Watson,** O.B.E. will also become assistant managing director of Castrol Industrial Ltd upon the retirement of **W. F. List** on the same date.

P. L. McIlmoyle, M.A. (Cantab), A.R.I.C., A.F.Inst. Pet., F.B.I.S., has been appointed assistant manager of the Purchasing Department of Castrol Ltd. Mr McIlmoyle, who is 28, joined Castrol in 1954 as a research and development chemist and transferred to the Purchasing Department in 1960.

P. L. McIlmoyle

Colin Waters

J. S. Rhodes

Colin Waters has been appointed general manager and **John S. Rhodes** assistant general manager of Castrol Ltd in South and East Asia, while **S. H. Hasan** has become general manager, Pakistan.

Mr Waters joined the Company 14 years ago as a clerk in the Overseas Division in London. He was transferred to the South and East Asia Branch of the Company in 1956, where, in his new post, he is succeeding the late **I. B. Hearder.**

S. H. Hasan

J. S. Rhodes joined Castrol in 1937, and in 1948 transferred from London to the Company's India Branch, became manager, Karachi, in 1951 and general manager for Pakistan in 1957.

S. H. Hasan studied at Lucknow University and joined Castrol as a salesman in Karachi in 1950. Eight years later he was appointed divisional manager, Karachi.

J. S. Baldwin, Jr. has become manager of the Co-ordination and Petroleum Economics Department of Standard Oil Company (New Jersey). He succeeds **G. T. Piercy** who has been appointed executive assistant to the president of the Company.

Mr Baldwin, who is a graduate in chemical engineering of the Georgia Institute of Technology, joined the Refining Department of the Humble Oil & Refining Company in 1946. In 1954, he transferred to Jersey Standard in New York and for the next 6 years held various positions within the co-ordination and petroleum economics department, before being appointed deputy manager of the department in 1960. He has been succeeded in this post by **R. H. Harvey.**

We record with regret the recent death in New York of **Ralph O. Rhoades,** who was credited with the discovery of oil in Sheikdom of Kuwait.

Mr Rhoades joined Gulf Oil Corporation in 1926 and served as a geologist in South America, the Middle and Far East, and the East Indies. It was in 1935 that geological investigations which he was conducting led to the discovery of the Burgan field in Kuwait.

In 1940 he was appointed to the first of a number of senior executive positions which led him to becoming chairman of the board in 1959. He resigned from this post towards the end of 1960, but continued as a director until his death.

Dr Alexander Lewis, Jr, K. S. Manning, and **Ernest Cotton** have been named the respective heads of three new Gulf Oil Corporation departments, the Petrochemicals Department, the Product Supply Department, and the Refining Department, which have been formed from the former Manufacturing Department.

Dr Lewis is one of the Corporation's vice-presidents, and Messrs Manning and Cotton are both Gulf co-ordinators. All three have become members of the Corporation's Administrative Committee, and, in addition, Mr Manning has been appointed chairman of the Product Supply Council and Mr Cotton chairman of the Refining Council.

William L. Owen has been appointed general counsel of the Arabian American Oil Company. He joined Aramco's Law Department in 1951 after having served as counsel for the Trans-Arabian Pipe Line Company. Mr Owen, who received a law degree from Harvard Law School, has held a number of positions with Aramco and is presently general manager, Government Relations. In his new post, he succeeds **George W. Ray, Jr.**

Henry W. Grote has been named general manager with responsibility for physics, automotive and service laboratories, and semi-works and research service groups of Universal Oil Products Co. Mr Grote is a member of the American Chemical Society and American Institute of Chemical Engineers.

E. A. Ambrose has been appointed aviation manager of Caltex (Middle East) Ltd.

Dr **B. J. A. Bard,** who was previously vice-chairman of the Company, has succeeded Professor **W. R. Hawthorne** as chairman of Dracone Developments. Professor Hawthorne is retaining his seat on the board as technical adviser.

Another Dracone appointment is that of Rear-Admiral **G. A. M. Wilson,** to chief executive of the Company.

Charles E. Lamar has been appointed executive vice-president of the Southern Pipe Division of U.S. Industries Inc. Mr Lamar joined Southern Pipe in 1951 as a sales engineer, and prior to taking up his new post was vice-president – marketing.

W. E. Ryde, manager of the Rotherhithe (South East London) plant of the Castrol Group, has retired after 42 years service. He is seen here (left) *being presented with a cheque from the directors by W. F. List, assistant managing director of Castrol. From his head office colleagues, Mr Ryde received the grandfather clock seen in the background*

U.K. Petroleum Statistics 1960

The latest edition of the *Ministry of Power Statistical Digest* covers the year 1960, for which it gives details of production, consumption, and utilization of all types of fuel used within the United Kingdom.

One of the innovations in the petroleum section, extracts from which are contained in Tables I and II, is that statistics relating to the years 1948–1960 in the tables summarizing imports and exports and re-exports are now based on figures supplied by importers and exporters of oil. The more detailed tables concerning imports and exports and re-exports, which refer to countries of origin and destinations of products, continue to be based on statistics contained in the *Trade and Navigation Accounts of the United Kingdom*, but the figures for the years 1948–60 have been converted from gallons to tons by conversion factors associated with measurements taken at a temperature of 60° F to bring them in line with oil company practice. Standard 50° F factors have been used previously.

The statistics include records of total supplies of crude and process oils for the last 40 years and a breakdown for individual products for both quantity and value per ton for the

TABLE I

	1958	1959	1960
	(thousands of tons)		
Suppliers of crude oil and shale oil:			
Imports of crude and process oils	33,589·5	38,968·1	44,720·9
Indigenous crude production	79·9	82·7	85·4
Indigenous shale oil ...	63·4	60·5	59·9
TOTAL	33,732·8	39,111·3	44,866·2
Imports of crude and products:			
Crude and process oils ...	33,589·5	38,968·1	44,720·9
Aviation spirit	403	601	386
Motor spirit	1,943	2,242	2,115
Other spirit	125	118	295
Kerosine	1,118	1,286	729
Gas oil	1,961	2,076	2,179
Diesel oil	85	230	75
Fuel oil	4,873	5,416	7,289
Lubricating oils	404	411	489
Paraffin wax	30	32	36
Other sorts...	58	276	125
Total refined products	11,000	12,688	13,718
Exports and re-exports:			
Crude and process oils ...	6	121	49
Aviation and motor spirits	2,033	1,833	1,765 (a)
Other spirit	41	36	65
Kerosine	286	359	639
Gas oil	1,733	1,734	2,319
Diesel oil	487	439	402
Fuel oil	3,304	3,258	3,267
Lubricating oils	393	449	482
Paraffin wax	7	8	7
Other sorts...	76	78	97
Total refined products	8,360	8,194	9,043
Refining operations (b)			
Throughput of crude and process oils	32,933	39,136	44,465

	1958	1959	1960
	(thousands of tons)		
Output:			
Aviation spirit and wide-cut gasoline	1,322	1,376	1,285
Motor spirit	5,429	6,155	6,632
Industrial and white spirits	144	141	167
Kerosine	1,292	1,772	2,284
Gas diesel oil	6,285	7,241	7,648
Fuel oil	12,572	15,599	18,533
Lubricating oils	751	863	912
Bitumen	860	961	1,037
Butane and propane ...	91	126	154
Other petroleum gases ...	72	140	238
Paraffin wax	30	31	36
Miscellaneous products (c)	923	916	1,360
TOTAL	29,771	35,321	40,286
Refinery fuel (d)	2,503	3 032	3,290
Losses and changes in unfinished stocks (c) ...	659	783	889
	1949	1959	1960
Overseas production of crude petroleum by British and British-Dutch companies (e):			
Middle East:			
Iran	26,807	23,122	26,495
Iraq	2,035	20,653	23,603
Kuwait	5,730	32,185	37,599
Qatar	—	3,852	3,883
Africa (f)	1,735	699	1,167
Far East and Australasia ...	6,327	11,200	10,391
India, Pakistan, and Burma	436	1,188	1,174
Europe (excl. U.K.) ...	451	1,129	1,289
Caribbean and South America:			
Argentine	512	389	347
Ecuador	348	345	354
Colombia	1,090	1,901	1,973
Peru	361	477	544
Trinidad	2,880	2,974	3,107
Venezuela	23,780	47,700	44,929
TOTAL	72,492	147,814	156,855

(a) Comprising 791,000 tons of aviation spirit and 974,000 tons of motor spirit.

(b) Crude and process oils comprise all feedstocks, other than distillation benzines, for treatment at refinery plants. Refinery production does not cover further treatment of finished products for special grades such as in distillation plant for the preparation of industrial spirits.

(c) Losses are estimated at 2 per cent of total throughput. The figures for miscellaneous products are obtained as a residual.

(d) Approximately 50 per cent gases and 45 per cent fuel oil in 1959.

(e) Excluding production by British companies in North America.

(f) For 1949, the figures relate entirely to Egypt. British companies' property in Egypt sequestrated from November 1956 to June 1959.

same period. The summary relating to supply and disposals has been expanded to include general details for each year since 1938 and details for individual products for 1949 and each of the last 5 years.

The Digest also includes details of refinery throughput and output of refined products for 1938 and for each year from 1949 to 1960. These statistics are also given for each two-monthly period from 1956 to 1960. Particulars of deliveries of petroleum products for inland consumption are given on a similar basis, except that there is now also a separate table giving details for individual countries in the United Kingdom. The usual analysis of inland deliveries of gas/diesel and fuel oils is also more detailed than usual, as are the tables concerning the use of liquid fuels for burning, which now include statistics for 4/5 week periods instead of 8/9 week periods as was previously the case.

Other statistics included in the petroleum section of the Digest deal with crude oil distillation capacity at refineries; number of persons employed in petroleum distribution and refining; wages and salaries; capital expenditure; and value of output in petroleum and shale refining.

TABLE II
CRUDE OIL DISTILLATION CAPACITY AT REFINERIES

		1953 (*thousand tons a year*)	1960 (*thousand tons a year*)
Esso Petroleum Co. Ltd	Fawley	7,200	11,900
	Milford Haven	—	4,600
The Shell Petroleum Co. Ltd ...	Shell Haven	3,290	7,960
	Stanlow	4,500	5,360
	Heysham	1,760	1,870
	Ardrossan	—	160
The British Petroleum Co. Ltd	Kent	4,000	8,400
	Llandarcy	4,000	3,150
	Grangemouth	2,500	3,100
	Pumpherston	180	180
Mobil Oil Co. Ltd	Coryton	873	1,900
Berry Wiggins & Co. Ltd ...	Kingsnorth	69	160
	Weaste	56	140
Lobitos Oilfields Ltd	Ellesmere Port	115	200
Manchester Oil Refinery Ltd ...	Barton	125	150
Briggs & Sons Ltd	Dundee (Camperdown)	37	60
	TOTAL	28,705	42,290

Aramco Reports Record Production in 1960

Production of crude oil by the Arabian American Oil Company reached a record level of 456,453,173 brl last year, according to the 1960 *Report of Operations to the Saudi Arab Government by the Arabian American Oil Company*. This figure was 56,632,583 brl, or 13·9 per cent higher than the 1959 total of 399,820,590 brl.

Other production records achieved by the Company occurred on 22 November, when there was a record output for a single day of 1,492,697 brl, and during the month of December, when the average daily production of 1,492,014 brl was the highest in any month in the Company's history. On 13 June 1960 Aramco produced its 4000 millionth barrel of oil, and at the end of 1960, 22 years after the beginning of commercial production in Saudi Arabia, the cumulative total production had reached 4,256,613,367 brl.

The number of Company wells producing at the end of 1960 was 196, and the average daily production in the major fields was:

	bd
Ghawar	714,257
Abqaiq	299,714
Safaniya	181,000
Dammam	38,585
Qatif	16,171

The Khursaniyah field, placed in production early in October 1960, produced 489,427 brl in 88 days.

Geological and geophysical exploration continued throughout the year in remote sectors of the Rub' al-Khali. Reconnaissance drilling was carried out in the Abu Bahr-Southern Summan and Tumaisha areas, while structure-stratigraphic holes averaging 8500 ft in depth were drilled on the southern and eastern edges of the sands of the Rub' al-Khali. Continuous refraction seismic surveys were carried out as an extension of the previous years' work in the south-eastern and central parts of the region. Continuous refraction surveys were also run in the difficult terrain west of the sand mountain country in the southern, central, and eastern Rub' al-Khali.

The main drilling programme was devoted mainly to defining limits of existing fields. Additional reserves discovered exceeded production during the year by about 7000 million brl. Proved recoverable reserves at the end of the year were estimated at 45,600 million brl.

Seventeen new wells were completed during the year. Two delineation wells were drilled in an attempt to establish the northerly extent of the Khurais field, which is presently 65 km long and 15 km across at its widest point.

Although the Manifa field is not completely delineated, the Company states that it is known to be 25 km long and 16 km wide and to have six crude reservoirs, the Upper Ratawi, the Lower Ratawi, the Manifa, and the Arab Zone A, B, and C members. Two offshore wells were added in the field during the year.

Four delineation wells drilled in the Safaniya field, probably the largest offshore oilfield in the world, showed that it is probably twice as large as believed earlier. Efforts were also made by the Company to determine the extent of the Abu Hadriya field.

At Abqaiq, construction began on an LPG injection plant, costing nearly £3 million, which is designed to compress and liquefy 55 million cu ft/day of gas.

The 62-mile, 30-in Khursaniyah–Ras Tanura No 2 pipeline was completed at the beginning of October. Earlier in the year, the Company had completed the 5-mile, 30-in T-12 transfer line between the Ras Tanura refinery and marine terminal, and the 18-mile, 34 and 36-in Qatif–Ras Tanura line. The latter line is the largest in diameter ever built by Aramco.

During the year, Ras Tanura refinery processed 82,311,386 brl of crude. This was 18 per cent of total crude production, and 29·4 per cent more than was processed in 1959. Production at the refinery's alkylation plant increased to the extent that supplies of aviation gasoline exceeded Saudi Arabia's internal requirements, and the Company began to export this product. The alkylation plant commenced operation in June 1959.

Welding Research Engineering Laboratory

A. Robert Jenkins, J.P., presenting Lord Mills with an engraved paper-knife following the opening of the Laboratory. Sir Charles S. Lillicrap, K.C.B., M.B.E., President of the BWRA is also in the picture

Expansion in BWRA Facilities

The already extensive research facilities at the British Welding Research Association's station at Abington Hall, Cambridge, have been supplemented recently by the building of a new 21,000 sq ft engineering laboratory which was formally opened by the Rt Hon Lord Mills, P.C., K.B.E. on 12 July.

Since Abington Hall was acquired by the BWRA in 1946, and a staff of less than half-a-dozen commenced work, the researches now being transferred have been carried out in former stables and ex-army huts. In spite of these difficult working conditions the Association has been able to sustain a heavy programme of research and to deal with an extremely wide range of industrial problems. The need has arisen, however, to initiate several new and important lines of research and to extend considerably the range of available scientific and commercial equipment if the demand for the Association's services is fully to be met over the next few years. In addition to providing proper facilities for such research the new building will relieve the congestion in other laboratories and thus enable metallurgical researches to be expanded.

The new engineering laboratory is a two-storey plastically designed all-welded steel-frame structure. The accuracy of the plastic design methods, which have been developed for rigid-jointed frameworks of mild steel, is not affected by the occurrence of residual stress, sinking of supports, stress concentrations, etc. The principal advantage of the method is the saving in steel which it allows. The building was designed by Messrs H. C. Hughes and P. Bicknell of Cambridge and constructed by Messrs Rattee and Kett Ltd, also of Cambridge.

The ground floor of the new laboratory is laid out on the "open-plan" system without dividing walls between the various sections. The upper floor consists entirely of office space. The ground floor houses the machinery and testing equipment of the pressure vessels, brittle fracture, and resistance welding sections, and the machine shop.

The range of work undertaken in these laboratory sections of the engineering block may be gauged by the following outline of their investigational work.

PRESSURE VESSEL SECTION

This section involves the study of the behaviour of complete vessels, vessel nozzles, gusseted pipe bends, small bore high pressure piping, and tube plates. Work is being carried out on low alloy steel, in addition to mild steel, vessels. Some of the plant used for these investigations, and details of the programme, are described below.

Pulsating Pressure Plant

Pressure vessels are subjected to repeated applications of hydrostatic pressure at room temperature, and equipment is used for fatigue strength determinations of complete vessels. With pressure limits adjustable to 6000 lb in^2, the plant is capable of subjecting a vessel of 6 cu ft volume to a pressure of 1500 lb in^2 100 times per minute.

Static Pressure Plant

A fixed pump driven through a magnetic clutch delivers 3 gal min at pressures up to 12,000 lb in^2. Among other uses it will provide hydraulic power for the 4000 ton brittle fracture tensile test equipment. A portable pump is used for tests on small pressure vessels.

Strain Gauge Equipment

A selection of strain gauges and strain measuring equipment was displayed. A model of a waterproofed strain gauge as employed at the inner surface of vessels undergoing hydrostatic test, and a gland for strain gauge leads, were included.

High Pressure Fatigue Machine

Developed at Bristol University, this machine subjects small tubular test pieces to repeated applications of pressure at 800 c.p.m. The upper and lower pressure limits are adjustable over wide ranges, with maximum pressure of 20 tons in^2. Some of the results of tests on thick-walled piping containing transverse butt welds are shown, and indicate that mild steel pipes are not weakened by welding.

Pressure Vessel Nozzles

The design of nozzles and openings relies on empirical rules

traditional to design codes. These rules lead to massive reinforcements which sometimes cause cracking during welding, and are not always effective in reducing stresses to an acceptable level. However, work has reached the stage where rational design is possible, and new design proposals have been formulated at BWRA.

For design purposes, the most valuable finding was that fatigue strength correlated with peak stress, or stress concentration factor. Extensive computer calculations have been made of stress concentration factors for nozzles, and these have been verified in numerous strain measurements on full size drums. The proposed design method entails less arithmetic than the old method, and determines nozzle scantlings for a constant chosen value of stress concentration factor.

Fully detailed papers are available as BWRA reports.

Low-Alloy Steel Pressure Vessels

Spherical pressure vessels, 30 in diameter · 0·75 in thick, are subjected to repeated pressure testing. The tests furnish comparative information on strength and are intended to resolve the material properties which should be taken into account in selecting a suitable design stress for each steel. A plain opening of 6 in diameter, closed by a loose internal cover, is machined in each vessel, and provides a stress-raising feature at which plastic deformation and, ultimately, fatigue failure can be observed.

Gusseted Pipe Bends

In critical applications, components of piping systems may be subjected to such severe bending effects due to restrained thermal expansion that fatigue failure can ensue. Fabricated bends are used in large-diameter duct and pipe systems, and for their satisfactory design a knowledge of fatigue strength is essential.

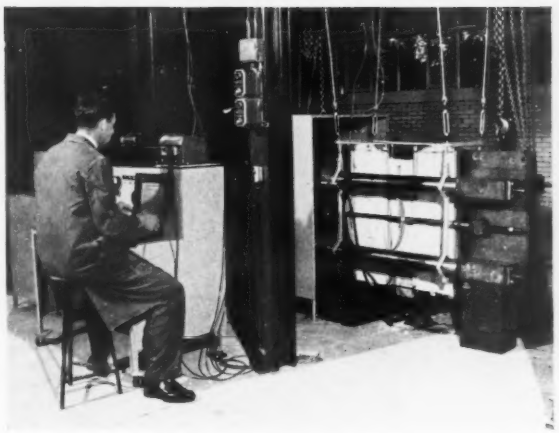
Tube Plate

Repeated-tension fatigue tests have been carried out on flat plates pierced by arrays of holes, simulating the tube plates of water tube boilers, with the object of providing information on which to base a more precise choice of tube plate thickness than that currently possible.

BRITTLE FRACTURE SECTION

Growing interest in the welded fabrication of thick steel plate sections and in the construction of plant for service of diminished temperatures gives special emphasis to the problem of brittle fracture. The brittle fracture researches carried out in this laboratory are thus currently concerned with plate thicknesses up to 6 in, and temperatures down to that of liquid nitrogen.

General view of the Pressure Vessel Laboratory



A 1-in thick plate under test in the Brittle Fracture Laboratory's 700-ton tensile test rig. Solid carbon dioxide, packed either side of the plate, reduced the temperature in this instance to −45 before load was applied

700-Ton Test Rig

Suitable for tensile tests on notched and welded plates up to 36 in wide and 1 in thick. Now being used for tests on nickel steels at very low temperatures with liquid nitrogen cooling.

2000-Ton Test Rig

Extensively used in the past for tensile tests on notched and welded mild steel plates up to 36-in width and 3-in thickness. More recently, stress relieved and low alloy steel specimens have been waisted in order to permit fractures within the rated load capacity. .

4000-Ton Test Rig

A test rig is now being built to produce fracture in mild steel plates 36 in wide and 6 in thick or weldable low alloy steel plates in somewhat smaller thicknesses. This machine will have a longer working stroke than those used earlier, and this will assist in accommodating the greater elastic deformations of high strength steels.

Tests on Six Steels of One Inch Thickness

Broken specimens are shown, with curves of temperature versus applied stress at fracture for as-welded, notched wide plate specimens in three semi-killed and three fully-killed normalized steels. The investigation has revealed information on transition temperature correlation with respect to wide plate behaviour and Charpy tests on the materials in the strain aged condition.

Wide Plate Tests on Normalized Low Carbon Steel Plates

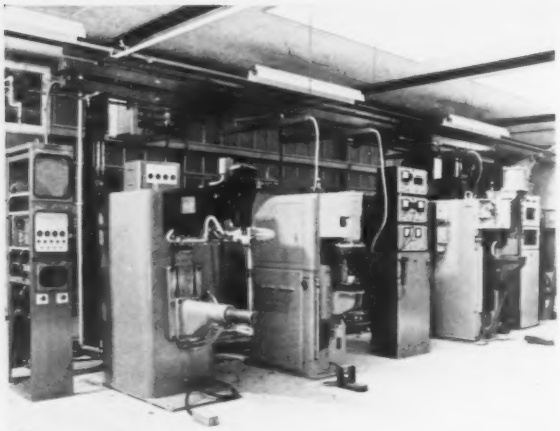
Broken specimens are shown, with curves of temperature versus applied stress at fracture for as-welded and stress relieved conditions, with both surface and centre notches and the weld preparation. Plates are of 1-in and 3-in thickness.

Charpy Machine

Fundamental work on crack nucleation and propagation, conducted with the help of impact tests, was illustrated with photomicrographs of fractures and time load oscillograms.

Local Stress Relief

The success of furnace stress relieving in protecting welded structures from brittle fracture has prompted an investigation



Part of the new Resistance Welding Laboratory showing some of the spot welding equipment

to design satisfactory methods of local heat treatment to achieve the same end. Temperature profiles for heated bands along welds in flat and curved plates have been calculated with the object of securing minimum elastic thermal stresses. The best of these are being investigated experimentally to check the degree of stress relief at the welds and the residual stress accumulations elsewhere.

RESISTANCE WELDING SECTION

The department has doubled in size in the last two years and is now well-equipped to carry out most aspects of resistance welding research. The work of the department can be covered by three main headings:—

1. *Fundamentals of Resistance Welding*

Recent work on single sheet and two sheet spot welds has produced encouraging results and work is proceeding to relate measurement with theory. An application of this technique of particular interest is in welding of hardenable steels as it gives a picture of the thermal cycle. Temperature measuring techniques are being developed to follow the thermal cycle.

Work is also being carried out on the determination of weld, quench, and temper techniques for various hardenable steels, the aim being to reduce the number of welds which have to be made to find optimum welding conditions. Work in connexion with determining acceptable seam welding conditions for high strength stainless steels pinpointed the need for a representative strength test. A number of tests were investigated, and the tension-peel strength test devised. This gives a truer picture of weld strength than tests used at present.

2. *Research into the Welding of Specific Materials*

An investigation into the spot and seam welding of five stainless steels for the Ministry of Aviation has recently been completed. The use of continuous ac current seam welding has been shown to give welds of the same strength as interrupted current welds.

Work on nimonic alloys is being carried out and includes high temperature strength tests, effects of post-weld heat treatment, seam welding, and investigation into welding of new alloys.

Research has just started on the automatic welding and post-heating of wire for drawing purposes. This work is based on existing practice in the wire-drawing industry.

3. *Liaison Work on Resistance Welding*

The third aspect of the department's work is the investigation of BWRA members' production problems. In most cases the problem is investigated, acceptable welding conditions are determined for the components, and a report is produced for the member concerned.

WELDING SHOP

The Welding Shop is equipped for manual and automatic metal-arc welding, gas cutting, etc., and deals with a continuous demand for test specimens, in particular for the engineering investigations. Typical products include model spheres for pulsating pressure tests; small scale plate guides for fatigue studies; butt welds for brittle fracture tests; pipeline components, and a variety of butt and fillet specimens for fatigue testing, including specimens with controlled defects. Much of the welding needs to be of the highest standard, and facilities for non-destructive testing are located in an adjacent section of the building.

MACHINE SHOP

This occupies three-and-a-half bays in the new Engineering Block, and handles a wide variety of work from the preparation of test specimens for the engineering researches, to the construction of machines and equipment for the Research Station as a whole. Equipment produced here has included high tensile, and torsion testing machines, a liquid nitrogen flask for use in brittle fracture researches, and a friction welding machine.

QUALITY ASSESSMENT OF PETROLEUM PRODUCTS

In 1954 the Institute published a small book entitled *Significance of Properties of Petroleum Products*, which had the object of providing some background on the influence of the properties of petroleum products on their performance and on the interpretation of the results of standard tests.

The need for a new edition, which has been apparent for some time, has resulted in the publication of an entirely new booklet entitled *Quality Assessment of Petroleum Products*, price 12*s* 6*d* for IP members and 15*s* for non-members, which treats the subject in a different way. The Institute has attempted to enhance the value of the publication by treating the subject of the properties of petroleum products on the basis of products rather than from the standpoint of individual properties as in the previous publication.

The book is intended to supplement the published IP and ASTM Standards by giving further information of the background significance of the tests and some guidance on their use in assessing the quality and performance characteristics of the products.

Work at the Warren Spring Laboratory

The 1960 *Report of the Warren Spring Laboratory* of the DSIR records an intensive programme of research work carried out at the Laboratory during its first full year since it was opened. This work embraced atmospheric pollution, chemical engineering and process development, mineral processing, and human sciences.

The principal work of the Chemical Engineering Section was concerned with the factors which determine the efficiency of gas absorption and distillation equipment. These factors included interfacial area and mean bubble size in clouds of bubbles, mass transfer rates with and without chemical reaction, and the residence times of fluids passing through typical gas-liquid contacting apparatus. The dynamic behaviour of the distillation column is also reported to be under study, with the eventual aim of programming a small analogue computer to control or optimize the operation of the equipment.

Apart from its work on the Fischer-Tropsch process, which is described in more detail in the next column, the Process Development Section also carried out research into the surface chemistry of fuel cells on behalf of the National Research Development Corporation.

Atmospheric Pollution

Much of the work carried out by the Atmospheric Pollution Division of the Laboratory was devoted to obtaining information on the distribution of pollutants in towns and cities. However, it also undertook investigations on various abatement problems.

One of these concerned the prevention of acid smuts from the combustion of fuel oil. For smaller and more typical industrial installations, the solution is generally comparatively simple. Metal chimneys, for example, can be lagged to maintain the temperature above the acid dew-point, thereby preventing the formation of smuts. With the larger boiler installations operated under conditions of high thermal efficiency, such as in power stations, the problem is more complex.

Because it was felt that there might still be a problem with brick chimneys, the Laboratory asked local authorities to submit particulars of all chimneys in their areas emitting smuts. Less than 200 such chimneys were reported, of which 80 were brick. Examination of a number of these showed that the trouble could be cured by ordinary principles of good boiler-house practice. However, in a few instances it was found that the fitting of devices to chimney tops to remove smuts, or the injection of alkali dust to prevent condensation might be required.

Another investigation undertaken by the Atmospheric Pollution Division concerned the removal of smoke from the exhaust gas of diesel engines. Among the methods which were tried experimentally were catalytic combustion, filtration, and scrubbing. Whilst it was found that smoke could be removed from the exhaust gas under laboratory conditions, no cheap and foolproof method could be devised for practical application to road transport.

Two devices that were claimed to remove smoke from diesel exhaust gas were tested on a 10-ton diesel lorry but proved to be unsuccessful. The Laboratory is now examining a third device, based on an electrostatic precipitator.

Experimental work on methods of removal has, however, been brought to an end. In view of the ease with which, by proper operation and maintenance of the engine, the emission of smoke can be prevented, and the difficulty of removing smoke once it has been formed, work is now going on to see whether it would be possible to develop a device to measure the density of a smoke cloud emitted by a vehicle, as an aid to setting and, if necessary, enforcing a satisfactory standard of practice. Preliminary work has shown that it might, in some circumstances, be possible to measure the obscuration produced by the exhaust smoke of a particular vehicle by means of an instrument mounted on a bollard in the middle of the road or on an overtaking vehicle.

The Fischer-Tropsch Process

After studying the technical and economic possibilities of the production of oil from coal, the Committee on Coal Derivatives concluded that the present cost of synthesis gas rendered oil synthesis uneconomic in the U.K. It considered that the Fischer-Tropsch synthesis was many years in advance of the possible development in gasification, and recommended that technological work on the process at the Laboratory should be wound up. Work on catalyst and reactor development was, therefore, limited to achieving the immediate objectives of the programme of research.

Included in this work was the improvement of catalysts based on precipitated iron oxide promoted with copper and potassium. Examination of the effect of varying the copper content showed the optimum copper content to be 2 to 4 parts per 100 parts of iron. High proportions of copper (10 parts) decreased activity, while the omission of copper gave a catalyst of normal initial activity but short active life.

The reaction, mentioned in the previous year's report, in which the addition of barium as nitrate, in slight excess over that required to form barium sulphate, counteracted the deleterious effect of sulphate ion in iron catalysts, was confirmed for catalysts containing up to 1·8 per cent of sulphur trioxide, a sulphur content which would otherwise completely inactivate the catalyst. Preliminary observations suggested that barium by itself has a negligible promoting effect.

Catalysts based on iron oxide normally require an activating treatment with a reducing gas before attaining maximum reactivity. The method of initiating synthesis by heating the slurry containing unactivated catalyst to reaction temperature, while at the same time maintaining normal operating pressure of 10 atmospheres and gas flow rate, was proved to be a reproducible and satisfactory method of activation.

A short study carried out of the effect of operating pressure over the range 10 to 30 atmospheres in the liquid phase system confirmed that the space-time conversion of process gas at a constant level of conversion is proportional to operating pressure. The productivity of the catalyst, defined as the total gas converted during active life, was found, however, to be unaffected by pressure.

The Laboratory also continued its investigations on a pilot scale reactor designed to solve the mechanical problems associated with the large scale operation of the slurry process.

In the field of catalyst research a more thorough study was started of the relationship between electrical properties and catalytic activity. The system chosen for the investigation was iron oxide (Fe_2O_3) containing small concentrations of titanium oxide.

Books and Films

Introduction to the World Petroleum Congress

An introductory brochure describing the scope and arrangements for the Sixth World Petroleum Congress to be held in Frankfurt-on-the-Main from 19–26 June 1963 is available from the General Secretariat for the Congress "Wallhof", 2–4 Glockengie Berwall, Hamburg 1, Germany, or from the offices of the Institute of Petroleum.

The brochure is printed in English, French, and German. In addition to details of the scientific programme laid down for the Congress, it contains a description of the work of the Permanent Council of the World Petroleum Congress, an introduction to Frankfurt, and a brief outline of excursions and social events which are being organized.

It also includes a preliminary registration card for those who wish to attend the Congress or are intending exhibitors at the Technical Exhibition which is to be held at the same time.

"Suez Canal Tanker Traffic"

At the present time, any vessel with a draught of 37 ft or more cannot pass through the Suez Canal with a full cargo. Although this affects only about 140 out of the world's 2800 tankers, *Suez Canal Tanker Traffic*, published recently by W. G. Weston Ltd, stresses the likelihood of many new vessels suffering from this handicap over the next few years.

Last year tanker tonnage accounted for 71 per cent of transits through the Canal. Of these, 1778 out of 9755 tankers had a draught of 34 ft or more. This compares with 278 tankers of this draught which used the Canal in 1955. In both years the maximum permissible draught was 35 ft, but from April of this year this was increased to 37 ft.

The Egyptians have impressive plans to further improve the Canal, including two-way traffic. Commenting on these plans, the report emphasizes the difficulty in drawing up a timetable of improvements.

When the plans already announced are carried out, the resulting maximum draught will be about 42 ft, which will be sufficient for vessels up to 60,000 dw tons. About 160 of the vessels currently on order have a draught in excess of 37 ft, and these are the vessels most likely to trade from the Persian Gulf, and, therefore, to be customers for the Canal.

In view of the enormous cost of deepening it to 42 ft, the report advises owners to exercise caution when considering what the canal will be like in 5 years time.

Free Guidance for over 500 Firms

Directors of more than 500 companies have received a copy of Britain's first-ever *Export Assistance Register* from the Institute of Directors' Export Action Now Committee.

Listed in the register are some 600 companies, manufacturing more than 500 different main categories of goods, who have offered export assistance to non-competing concerns. These companies have undertaken to give free export help and guidance of a general nature although specific propositions will be a matter for individual arrangement between companies concerned.

The Register is set out in such a way that directors of firms seeking help can choose a "guide" company, either by product or location, or can approach a company with specialist experience of a particular territory overseas.

Copies of the first edition are available to interested Trade Associations on request to the Institute of Directors, 10 Belgrave Square, London, S.W.1.

Films Catalogue

The 1961 Petroleum Films Bureau catalogue lists over 250 16mm and 35mm documentary films which are on free loan to responsible organizations. The subjects cover most aspects of the petroleum industry, aviation and motoring, power and engineering, agriculture and horticulture, and safety.

Copies of the catalogue are available free of charge from the Bureau at 29 New Bond Street, London, W.1.

British Petroleum Equipment 1961/2

The 1961/2 edition of British Petroleum Equipment contains a complete list of all member firms of the Council of British Manufacturers of Petroleum Equipment, their addresses, telephone numbers, and spheres of activity. It also includes a Classified List of equipment and services provided by member firms broken down into 2000 separate headings. A fully cross-referenced 10-page index solves the problem of alternative headings.

One of the most useful sections of the directory is an 812 page Buyers' Guide, devoted to announcements from member firms which are, in fact condensed catalogues and specification sheets of company products.

British Petroleum Equipment 1961/2 costs £2 10*s* 0*d* from the CBMPE, 2 Princes Row, London, S.W.1.

Vapour Pressure Tables

Dampfdrucktabellen nichtassoziierender Stoffe (Vapour Pressure Tables of non-associating Substances) edited by E. Oehley, has just been published as a new edition to the Dechema-Erfahrungsaustausch series. The booklet enables approximate temperatures under a wide range of pressures to be obtained, providing the boiling temperature at 760 mm hg is known.

The 42-page booklet can be obtained from the DECHEMA Deutsche Gesellschaft für chemisches Apparatewesen E.V., Frankfurt (Main) 7, Postfach 7746. The price to DECHEMA members is DM 13.40, and to non-members DM 16.80, plus postage.

British Standards

Metallic Spiral-Wound Gaskets for the Petroleum and Petrochemical Industry

Gaskets complying with the new British Standard BS 3381:1961 will be interchangeable with spiral-wound gaskets standardized by the American Petroleum Institute.

The standard, which costs 5*s* 0*d*, specifies the design, materials, and dimensions of metallic spiral-wound gaskets for use in flanged pipe joints having raised face flanges ($\frac{1}{16}$ in and $\frac{1}{4}$ in) as defined in BS 1560. These gaskets are for use with flanges of Classes 150, 300, 400, 600, 900, and 1500 in nominal sizes of $\frac{1}{2}$ in to 24 in inclusive.

Pearlitic Malleable Iron Castings

A level of quality for pearlitic malleable iron castings and tests for ensuring that castings come up to this standard are laid down in BS 3333:1961. Since the properties specified can be obtained by various manufacturing techniques, the Standard does not stipulate any particular process.

Castings are divided into two grades and requirements and tests for tensile strength, permanent set stress, elongation and

hardness are laid down for each grade. Requirements are also laid down for microstructure, workmanship, and finish of castings.

Heat treatment of test bars is dealt with and dimensions are specified for tensile test bars. The Standard is priced at 4*s* 6*d*.

WAR OFFICE APPROVED HD OILS

The following additional oils have been approved by the Director of Chemical Inspection, The War Office, as complying with the requirements of Defence Specification DEF-2101.

Supplier and supplier's nomenclature	*OMD grade of oil*
A.B. Nynas-Petroleum:	
13 DM 30	110
BP Trading Ltd:	
BP Energol 1197 SAE 30	110
BP 2515	330
Caltex Oil (Australia) Pty Ltd:	
Caltex RPM Motor Oil SAE 30	110
Caltex RPM Motor Oil SAE 50	330
Caltex RPM Motor Oil SAE 10W	40
Castrol Ltd:	
Product H 26/61	110
Product H2 5/61	110
Esso Petroleum Co. Ltd:	
—	60
—	60
—	110
—	40
TSD 1262	110
—	60
G.E.R. Deurag Nerag:	
Nerag Motorenol 810 HD SAE 50 Supp. 1	330
Government Oil Refineries, Baghdad:	
Gora Premium HD Motor Oil SAE 30	110
Gora Premium HD Motor Oil SAE 10W	110
Isaac Bentley & Co. Ltd:	
Vinextra 30 HD	110
Vinextra 20/20W HD	60
Manchester Oil Refinery Ltd:	
Primor Mil 30 HD	110
Primor Mil 20 HD	60
Maxima Lubricants Ltd:	
Maxima A.M. 30X	110
Mineralolwerke Albrecht and Co.:	
Mac HD Motor Oil SAE 20W	60
Mobil Oil Co. Ltd:	
—	110
—	110
—	110
TSL 1110	330
TSL 1104	40
Mobil AG:	
Motrex 105 SAE 50	330
Regent Oil Co. Ltd:	
RPM Delo Special 30	110
Shell International Petroleum Co. Ltd:	
Shell Oil S.6074	60
Shell Oil S.5898	110
Sternol Ltd:	
Panther 20	50
Wintershall A.G.:	
Salzbergener HD Motorenöl Cl. SAE 20 20W	60

Cancellations

The following qualifications have been cancelled or withdrawn on expiry of the approved period:

Nos UKHD	454–6	479
	461–2	483
	470–1	1178
	473–6	1224

OIL COMPANIES SPEND ANOTHER £25 MILLION IN BRITAIN

In the second quarter of this year, the oil companies ordered materials and equipment to a value of £25,140,000 from British firms, according to figures compiled by the Oil Companies Materials Association and published by the Council of British Manufacturers of Petroleum Equipment. This was some £2 million less than the corresponding value of orders received during the first quarter, but the decline is explained by a decrease in the amount of orders for bulk chemicals, which were worth just under £6 million during April/June compared with £7½ million during January/March. The value of all the first-quarter orders was £27,113,000 making a six-month total of £52,253,000.

The comparison of orders in the April June quarter of 1961 with those of the corresponding quarter of 1960 are given in the following table.

	1961 *April–June*	1960 *April–June*
Geophysical and other exploratory equipment, etc.	35,093	53,059
Specialized equipment for oil drilling and production including oil casing, tubing, etc.	1,375,858	2,274,121
Specialized equipment for oil refineries, etc. (not including pumps and valves)	2,309,469	1,867,572
Drums and can-making, filling and cleaning equipment, kerbside pumps and other metering and dispensing equipment, etc.	951,561	1,253,165
Railcars, road tankers, aircraft refuellers, etc.	572,466	800,081
Drums, drumsheets and tinplate	1,466,838	1,370,159
Tankage (including tank fittings)	832,529	1,126,655
Tubulars, pipe fittings and valves (ferrous and non-ferrous)	2,399,498	2,773,763
Pumps (excluding slush, oilwell and kerbside)	470,033	550,780
Boilers, boiler house plant and accessories, etc.	100,846	136,170
Electrical equipment—motors generators, transformers	1,478,633	1,823,079
Instruments, meters and gauges etc.	512,132	625,378
Prime movers and compressors	714,593	986,760
Machine and hand tools, welding and miscellaneous machinery, and stores	1,641,087	1,640,525
Ferrous and non-ferrous plates, sections, sheets and bars	460,560	898,019
Automotive equipment, all types	1,278,866	2,164,753
Laboratory equipment and chemicals including hospital and medical supplies	407,347	450,728
Bulk chemicals, catalysts, barytes, etc.	5,817,530	6,130,299
Cement and other building materials and hardware, including timber	579,735	634,566
Commissary, general requisites for office, warehouse, household, clubs and sports, etc.	1,736,021	2,048,472
	£25,140,695	£29,608,104

Record Breaking

London - Moscow - London

Coach Trip

Peter Chapman, proprietor of a Northamptonshire coach firm, braked his 41-seater coach to a halt outside London's Guildhall recently only 4 days 16 hours after leaving the same spot. In the meantime the coach and its passengers had been to Moscow and back.

This record time was achieved in spite of delays of several hours at the Polish customs on both the outward and return journeys. Actual running time for the 3823-mile return journey was only 72¼ hours, which represented an average road speed of 51·6 mph.

The vehicle which made this fastest-ever London–Moscow–London coach journey, was a standard Bedford 41-seater with a "Fiesta Continental" body by Yeates of Loughborough. Powered by a standard Bedford 300 cu in diesel engine, the chassis has a 5-speed overdrive top gearbox and a Bedford 2-speed axle.

The coach crossed the Channel on the Dover–Ostend ferry. From there the route lay through Brussels to Helmstedt on the East-German border; then due east, skirting Berlin to Warsaw, Brest Litovsk, and on through Minsk and Smolensk to Moscow.

A 5½-hour hold-up at the Polish–Russian border upset the schedule for the outward journey, but Red Square, Moscow, was reached in an actual running time of 34 hr 50 min with an average road speed of 52·7 mph.

On the return trip there was another hold-up of 6½ hr at the Polish border, but despite this the party was back in London 49¼ hours after leaving Moscow. Running time for the homeward journey was 37½ hours, and the average road speed was 50·5 mph.

To judge from this photograph, which the party brought back from Moscow, traffic congestion is not one of the more pressing problems in the famous Red Square

Another view of Red Square, this time the coach can be seen under the walls of the Kremlin

Mobil Oil Company co-operated in the project and reserve supplies of diesel fuel and oil were carried in the coach on specially fitted racks. The food for the journey was supplied by B.E.A. and it was cooked by one of its stewards in a kitchen fitted at the rear of the coach.

MIDDLE EAST OIL PRODUCTION

The Kuwait Oil Co. Ltd's production during the first 7 months of the year averaged 1,660,026 bd.

	July	*Tons*	*Jan.–July*
Iraq Petroleum Co. Ltd ...	3,127,931		21,061,677
Basrah Petroleum Co. Ltd ...	857,734		5,466,647
Mosul Petroleum Co. Ltd ...	108,728		749,761
Qatar Petroleum Co. Ltd ...	707,299		4,804,347
Iraanse Aardolie Exploratie en Productie Mij	4,953,000		32,795,000
		Barrels	
Arabian American Oil Co. ...	39,707,269		294,369,600
Bahrain Petroleum Co. Ltd ...	1,395,219		9,579,196
Getty Oil Co. and American Independent Oil Co. (Kuwait-Saudi Arabia Neutral Zone)...	4,955,535		32,741,647

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for July was 1,501,000 tons, the total for 1 January to 31 July being 8,010,000 tons.

Crude processed at Aramco's Ras Tanura refinery during July was 6,547,471 brl, the total for 1 January to 31 July being 52,504,143 brl.

Lectures, Courses, and Conferences

Analytical Chemistry Research in Hungary

Professor L. Erdey of Budapest University will be speaking on "Research Work in Analytical Chemistry at the Technical University of Budapest" to a joint meeting of the Midlands Section of the Society for Analytical Chemistry and the Birmingham and Midlands Section of the Royal Institute of Chemistry at Birmingham University on 10 October. The meeting will start at 7 p.m., and will be open to visitors.

Atomic Absorption Spectrometry and Flame Photometry

Papers on "Application of Atomic Absorption Spectrometry to Metallurgical Analysis" by W. T. Elwell, F.R.I.C., and "Some Interferences in Flame Photometry" by M. S. W. Webb, B.Pharm., F.P.S., F.R.I.C., and P. C. Wildy, B.Sc. are to be given at a meeting in the Conference Room of the British Iron & Steel Research Association, Hoyle Street, Sheffield 3 at 7 p.m. on 10 October.

The meeting is being organised by the North of England Section and Physical Methods Group of the Society for Analytical Chemistry and the Modern Methods of Analysis Group of the Sheffield Metallurgical Association. Visitors are invited to attend.

Welding in Shipbuilding

A symposium on "Welding in Shipbuilding" is to be held from 30 October to 3 November 1961 at The Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London, E.C.3. The thirty-four papers will cover the fields of design, materials, yards and construction, welding and cutting, and quality control.

Details and enrolment forms are available from The Secretary, The Institute of Welding, 54 Princes Gate, Exhibition Road, London, S.W.7.

Effluent and Water Treatment Convention

The twelve papers to be presented at the Effluent and Water Treatment Exhibition and Convention at the Seymour Hall, London from 31 October to 3 November 1961, will include:

"Automation Applied to the Treatment of Water and Effluent," by D. F. G. Larkman, A.M.I.C.E., A.M.I.W.E. and K. G. Smith, Grad.I.Mech.E.

"Cooling Water Treatment," by E. L. Streatfield, Ph.D., B.Sc., F.R.I.C., M.I.Chem.E., P.A.I.W.E.

"History of Water Treatment in the United States," by Edward P. Schinman.

"Some Aspects of Chlorination in the Treatment of Waste Waters", by L. A. Allen, D.Sc., Ph.D., M.Sc., D.I.C., F.R.I.C., M.I.Biol.

"Corrosion Preventive Water Treatment in the U.S.S.R.", by Oleg Lenchevsky.

Symposium on Electron Spin Resonance

A symposium on Electron Spin Resonance will be held on 2 November at Queen Mary College, London. Full details are available from The Chemical Society, Burlington House, London, W.1.

Oil Hydraulic Power Transmission and Control

The Hydraulic Plant and Machinery Group of the Institution of Mechanical Engineers is to hold a conference on "Oil Hydraulic Power Transmission and Control" in the Institution's Main Meeting Hall on 29 and 30 November 1961. The provisional programme includes sesssions on: Pumps and Motors (two papers); Transmissions (five papers); Servos and Controls (four papers); and Applications (five papers). There is also to be a miscellaneous session of seven papers.

A registration form to attend the conference can be obtained from the Secretary of the Institution, 1 Birdcage Walk, London, S.W.1.

Pipes and Pipelines Exhibition

The 2nd International Pipes, Pipelines, Pumps, and Valves Exhibition and Convention is to be held at Earls Court, London, from 9–13 April 1962. There will be over 100 exhibitors, many of them from overseas.

A technical convention will take place in the exhibition buildings at the same time. Details of both events can be obtained from: The Organizer, Scientific Surveys Ltd, Exhibition Division, 97 Old Brompton Road, London, S.W.7.

The Chemical and Petroleum Engineering Exhibition

The 2nd Chemical and Petroleum Engineering Exhibition, which will take place at Olympia, London, from 20–30 June 1962, is expected to be the largest exhibition of chemical plant as well as oil getting transportation and refinery equipment ever held in Europe. It will take place under the joint sponsorship of the British Chemical Plant Manufacturers Association and the Council of British Manufacturers of Petroleum Equipment. Between 400 and 500 exhibitors will occupy some 240,000 sq ft of space in Olympia's three main halls and their galleries.

A 1000-seat lecture theatre will be built on the first floor of the Empire Hall, where the 3rd Congress of the European Federation of Chemical Engineering will be held during the course of the exhibition. This will include symposia on "Process Optimization", "Interaction between Fluids and Particles", "The Handling of Solids", and "The Physics and Chemistry of High Pressures".

The 4th Congress of the Federation of European Petroleum Equipment Manufacturers will be held from 25–28 June 1962 at Church House, Westminster. Approximately 20 technical papers covering Automation, New Corrosion Materials, Temperature Insulation, Aircraft Refuelling, and Future Trends in the Design of Drilling Equipment for the Petroleum Industry will be presented.

Further information can be obtained from: The Council of British Manufacturers of Petroleum Equipment, 2 Princes Row, London, S.W.1.

Special Courses in Higher Technology

Part 1 of the Bulletin of Special Courses in Higher Technology is now available, price 3*s* 6*d* post free, from the Secretary, Regional Advisory Council, Tavistock House South, Tavistock Square, London, W.C.1.

The Bulletin gives details of advanced courses being held in the London and Home Counties region during the autumn term which do not regularly appear in college prospectuses as part of a group course or as subjects offered for endorsement on Higher National Certificates.

Madrid Sectional Meeting of the World Power Conference

The first three of the ten volumes of the *Transactions of the Madrid Sectional Meeting of the World Power Conference* are now available from Percy Lund Humphries & Co. Ltd., 12 Bedford Square, London, W.C.1. The cost per set of the Transactions is £33, including carriage.

Equipment Developments

Hydraulic Drive for National T.32.S. Drawworks

In order to meet the special requirements of its associate company, Abu Dhabi Marine Areas, for offshore well servicing in the Persian Gulf, BP Exploration Company has developed a hydraulic drive to a National T.32.S. drawworks which it is hoped will show important advantages over conventional methods, particularly for this type of operation. The basic principle is similar to that used for many years in the operation of gun turrets in warships and aircraft.

BP has had hydraulic transmission for drilling equipment under development for some three years, and sufficient progress had been made by the end of 1959 to field-test a 200 hp drive into a mud pump. The successful results of these tests coincided with the necessity for a fully flameproof, remotely-powered drive for a marine well servicing outfit, the outcome of which is the present system. The greatly increased safety element, particularly important in Middle East operations, is an especially important advantage in this system. The workover rig can be lifted easily and safely in the presence of high-pressure gas.

Power for the drawworks is provided by a 400 hp, 12 RPH Paxman diesel engine having a maximum speed of 1250 rev min, the engine being arranged to drive two variable displacement hydraulic pumps at 950 rev min through reduction chain drives. The maximum displacement of these two pumps at 950 rev min is some 360 Imp gal min.

The hydraulic oil is transmitted to the drawworks on the derrick floor, where it drives two fixed angle hydraulic motors, one mounted at each end of the drawworks drive shaft. The use of hydraulics has enabled the omission of the usual torque convertor to the drawworks.

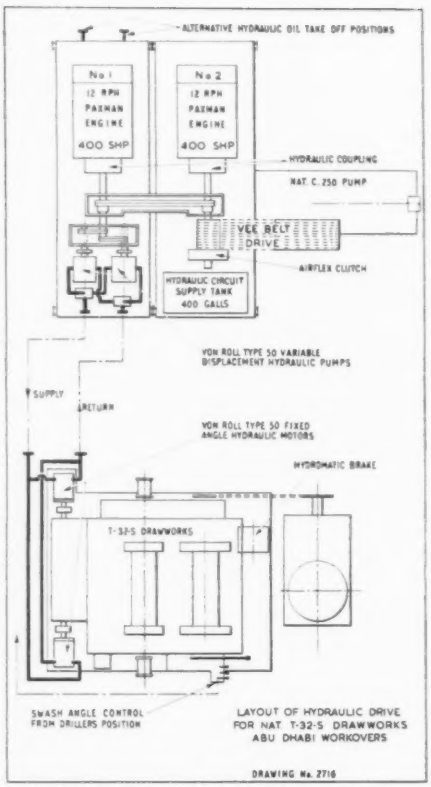
The rotary table drive is via the usual gearing through the drawworks, whilst the absence of the diesel engine gives more space on the rig floor, and there is a consequent absence of noise.

The two variable displacement hydraulic pumps are generally intended to be run at a constant speed of 950 rev min and variation of the swash plate angle between 0 and 25 , from a control at the driller's position, can vary their volume and pressure output to suit the load with consequent variation of speed and torque output of the hydraulic motors at the drawworks.

A second 400 hp, 12 RPH Paxman diesel engine is used to power a National C.250 mud pump by means of a conventional "V" belt drive, and both engines are mounted side by side and may be compounded together. This compound not only allows flexibility of operation in case of engine shutdown, but with both engines locked together, it will be possible to have available for pumping duties the balance of 800 hp minus only that required for rotary table operations, whilst still having full control of rotary table speed via swash plate angle.

When the outfit is in use for offshore well servicing, the diesel engine hydraulic pump unit will be positioned on the deck of a work barge some 200 ft away from the drawworks which is mounted on the helicopter deck of the wellhead platform. The hydraulic oil will then be transmitted by means of 4-in steel piping along the deck of the work barge and by 3½-in bore rotary hose up to the drawworks on the helicopter deck of the wellhead platform.

The prime movers and the hydraulic pumps showing the flexible hose through which 400 hp is being transmitted to the drawworks


ALTERNATIVE HYDRAULIC OIL TAKE OFF POSITIONS
No 1
12 RPH PAXMAN ENGINE 400 SHP
No 2
12 RPH PAXMAN ENGINE 400 SHP
HYDRAULIC COUPLING
NAT. C.250 PUMP
VEE BELT DRIVE
AIRFLEX CLUTCH
HYDRAULIC CIRCUIT SUPPLY TANK 400 GALLS
VOH ROLL TYPE 50 VARIABLE DISPLACEMENT HYDRAULIC PUMPS
SUPPLY
RETURN
VOH ROLL TYPE 50 FIXED ANGLE HYDRAULIC MOTORS
HYDROMATIC BRAKE
T-32-S DRAWWORKS
SWASH ANGLE CONTROL FROM DRILLERS POSITION
LAYOUT OF HYDRAULIC DRIVE FOR NAT. T-32-S DRAWWORKS ABU DHABI WORKOVERS
DRAWING No. 2716

To fill this circuit requires about 250 gal of oil and, consequently, a 400 gal supply tank is integrally mounted on No 2 engine base.

The whole outfit has been developed in association with Messrs Oil Well Engineering Company Ltd and was built and tested at their works. The outfit should commence operations in the Persian Gulf next Spring.

Such a BP drilling rig equipped with hydraulic drive has been under test at Retford in the Company's Nottinghamshire fields. Drilling was down to some 3300 ft at the end of August and would probably continue to 4200 ft. The weight on the bit was almost 100,000 lb and there were six lines between the crown and travelling block.

Water Storage and Transport in Desert Regions

A new answer to water storage problems in desert areas is provided by a French company which is making lightweight tanks of synthetic rubber and nylon.

The tanks, which can be filled and dismantled in a matter of minutes, are made of a five-layer neoprene nylon sandwich coated with aluminium pigmented *Hypalon* synthetic rubber paint. This prevents the accumulation of static electricity and guards against heat penetration. The walls are about 2mm thick and consist of three layers of neoprene bonded alternately on to two layers of nylon.

The tanks have internal partitions to prevent displacement of water during transport. They range in capacity from 500 to 30,000 litres, and are easily mounted on a truck. When emptied they can be rolled up and stored.

The manufacturers are Callou et Cie, 10 Rue Klock, Clichy/Seine, Paris, France, who claim that the tanks can also be used for storing motor spirit, fuel oils, and various liquid chemicals.

Trade News

Mobile Seismic Drill Rig

In initial trials in Libya of the new Joy Mobile *Seismic-Air 400* drill rig, 20-ft deep shot-holes are being drilled in four minutes using 1½-in round steels with 2-in X-type T.C. Joy bits. The new rig is a completely mobile, self-contained unit mounted on a Cummins-engined International Model 200 truck. It can be equipped for a variety of applications and hole depths. The new rig is produced by the Air Power Division of Joy-Sullivan Ltd.

Tecalemit Factory for Cornwall

Tecalemit Ltd is to build a factory at Pool, near Camborne in Cornwall. It will cover about 30,000 sq ft on a 15-acre site. It is expected to become fully operative within a year, and in the meantime the Company has taken over temporary premises in the town.

Mechanical Seal for High Speed Shaft Sealing

For high speed shaft sealing applications where axial space is at a premium, Flexibox Ltd, Nash Road, Trafford Park, Manchester 17, has developed a new mechanical seal—type DD. This new seal can cope with peripheral speeds up to 15,000 ft min, pressures up to 1000 psig and temperatures up to 500 F.

It is a face-type balanced mechanical seal of multi-spring design. It consists essentially of a housing which carries a resiliently mounted stationary rubbing face assembly consisting of a body insert and resilient packing. Face loading is provided by a number of small springs arranged round the flange of the stationary seal ring body to ensure close control and uniform application of the face contact pressure. There are three variants of the basic design, O-ring fitted, chevron packed, and reverse balanced. The standard range of sizes covers shaft diameters from ¼-in to 8-in.

U.K. Marketer for Dutch Instruments

Cockburns Ltd, of Glasgow, are now acting as British selling agents for the E.N.F.M. Company of Schiedam, Holland, marketing its pressure gauges, thermometers, and special control instruments.

Wiggins Gasholder for Bognor Regis

The Power-Gas Corporation Ltd is supplying a 900,000 cu ft capacity Wiggins dry seal gasholder to the Bognor Regis gasholder station, where it will replace a 500,000 cu ft three lift spiral gasholder built in 1911.

The new gasholder, 106 ft in diameter by 130 ft high, was specially designed to fit on the foundations of the old spiral gasholder.

Vapour Phase Caustic Treater for Fawley

Among several vessels which Mechans Ltd of Glasgow are producing for use at the Esso Refinery at Fawley are a vapour phase caustic treater which was delivered recently. Weighing 32 tons when empty, it is 59 ft 6 in high and 8 ft 0 in in diameter. The normal operating pressure will be 158 psig at 100 F, and it was tested to 340 psi hydraulic.

Contractor for Esso Pipeline

Constructors John Brown Ltd have tendered successfully for the construction of the 78-mile 6-in ethylene pipeline between the Esso Refinery, Fawley and the new ICI works at Severnside, near Bristol. The 2700 tons of 6-in steel line pipe is being supplied by Stewarts and Lloyds Ltd. Construction will start shortly, and the line is due for completion this year. Estimated cost is £850,000.

Castrol's Brazilian Company Re-named

The name of Castrol Group's member company in Brazil has been changed from Castrol (Lubrificantes) S.A. to Castrol do Brasil, S.A.

Shrouded Outlet Flow Heaters

A new range of *Kingsway* electrically operated shrouded outlet flow-heaters designed to heat fuel oil to pumping temperature at the outlet point of an oil storage tank, has been introduced by R. F. Landon & Partners Ltd, of Slough, Bucks. The heaters are rated so that they will heat the required volume of oil to the correct temperature at the outlet point even under severe frost conditions. The heating elements are designed so that the heat release per square inch of heating surface is kept down to the point where local overheating of the fuel and carbonization cannot take place.

New Ceramic Fibres

Fiberfrax alumina-silica fibres, a new class of high temperature insulating materials that are light in weight yet physically strong, are described in an eight-page colour brochure published by the Carborundum Co. With their low thermal conductivity, the fibres are claimed to withstand continuous use at temperatures up to 2300 F. The brochure reviews a few of their industrial applications and includes details of their chemical, thermal, and mechanical properties.

Copies of the brochure are available from the Carborundum Company, Niagara Falls, New York, U.S.A.

Dewrance Metals Division

Dewrance & Co. Ltd has formed a new division known as Dewrance Metals Division. It will consist of the foundry at Hillington and the Special Alloys Division in London, and will have its own board of management.

Flameproof Fluorescent Inspection Lamp

The new type "K" hand inspection lamp manufactured by J. M. Hargreave & Co. Ltd is the only fluorescent lamp to obtain a Buxton certificate for use in atmospheres of groups II and IIIa gases. It uses an 8W fluorescent tube, has an overall length of 18L in, and weighs less than 3 lb. Standard models can be used with voltages of 230 250 volts ac and 24 28 volts dc.

Perkins Italian Subsidiary

The Perkins Group has formed a new Italian company, Perkins S.p.A., to improve technical and field services in the country and expand sales of its diesel and gas turbine engines.

Additive Prevents Carburettor Fouling

Tests run on a 1959 Ford station wagon driven daily in Chicago traffic are claimed by UOP engineers to have shown that the company's gasoline additive *Unicor-LHS*, which is used by refiners and marketers to protect processing and transportation equipment from corrosion, prevents fouling of carburettor throats in cars. The additive is introduced into the gasoline during refining, and in addition to its detergent properties that keep carburettors clean, the additive is also said to be an effective anti-freeze and to improve ignition.

Piping Design Models

Construction of the piping design model for the new butyl rubber plant to be built at the Esso refinery at Fawley is being carried out by the Engineering Models Division of Revell Hayward & Co. Ltd. The Company has also received a contract for a piping design model for a Platformer unit for the Bataafse Internationale Petroleum Mij refinery in The Hague. Piping design models have also been sent recently to Santa Cruz and the U.S.S.R.

Improved Dry Lubrication

The addition of 2 per cent of a special composite type resin to the *Moly-vi-Bond* brand of molybdenum disulphide is claimed to give the product greater resistance to abrasion, to oxidation, and to attack by acids and alkalis. Since it also improves the elasticity of the film, it also facilitates processing of metals.

It is colourless and non-toxic. Application of the bonded coating is unchanged except that hot curing is essential.

Centrifugal Contactors and Solvent Extractors

A new illustrated brochure describing the Podbielniak range of centrifugal contactors, solvent extractors, chemical reactors, separators, and clarifiers is available from Clark Bros Co. Division, Dresser (Great Britain) Ltd, 197 Knightsbridge, London, S.W.7.

Chemical and Gas Engineering Catalogue

Products of the Holmes Organization is a new booklet describing the Chemical Engineering Division, the Gas Handling Division, and the Gas Cleaning Division of W. C. Holmes & Co. Ltd. It also contains a list of the Company's technical publications. The booklet can be obtained from the Company at P.O. Box 7, Turnbridge, Huddersfield, Yorkshire.

Photo-Electric Relay

Because of its small size, 7⅛ in × 5 in × 2⅞ in, Radiovisor claims that its new photo-electric relay, Type QT 60, can be adapted to suit virtually any industrial control operation. The instrument is transistorized, has a minimum light interruption of 0·025 sec, and a maximum 5 impulses sec rate of operation. A descriptive leaflet is available from Radiovisor Parent Ltd, Stanhope Works, High Path, London, S.W.19.

Thermocouples and Magnetic Oxygen Meters

A new leaflet published by the Cambridge Instrument Co. Ltd describes the Company's magnetic oxygen meters, which use methods based on the high paramagnetic susceptibility of the gas to determine oxygen concentrations. Another recently published brochure dealing with a range of rare- and base-metal thermocouples for temperatures up to 1500 C is also available from the same company at 13 Grosvenor Place, London, S.W.1.

U.S. Ball Valves to be Manufactured in U.K.

The Birmingham engineering group of Serck Ltd has formed a joint company with the Jamesbury Corporation of Massachusetts to manufacture and market the American parent company's "Double Seal" ball valve.

The new company will be known as Jamesbury-Serck Ltd, and will operate on an international basis. Manufacturing facilities will be provided at Serck Ltd's Gloucester factory.

Polypropylene Film Venture

Shorko Ltd and the Metal Box Co. Ltd are forming a joint company to manufacture polypropylene film and other film products in the United Kingdom.

The two companies are currently developing plans for the construction of a factory, the location of which is expected to be announced shortly.

This will be Shorko Ltd's first major project. The Company, which was formed last year, is jointly owned by Shell International Chemical Co. Ltd and the National Distillers and Chemical Corporation of New York. The American parent is one of the world's largest manufacturers of polyethylene and owns the Kordite Company, which manufactures plastic film for packaging.

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No candidate's identity will be disclosed without permission.

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Forthcoming Meetings

THE INSTITUTE

(*At* 61 *New Cavendish Street, London, W.*1, 5.30 *p.m.—tea* 5 *p.m.*)

Ladies Evening. Petroleum Products in Cosmetics. T. A. Brock, B.Sc., F.R.I.C., A.F.Inst. Pet. **20 October**

Molybdenum Disulphide as a Lubricant Additive in Rolling Contact—a Study of Compatability with Other Additives. D. Scott, F.I.M., and D. Jamieson, Grad.R.I.C. **1 November**

IP ESSEX BRANCH

(*At Bull Hotel, Pitsea*)

The Economics of Nuclear Power Production. S. A. Ghalib. **1 November**

IP FAWLEY BRANCH

(*At Bournemouth Municipal College*, 7.30 *p.m.*)

Wine Making. R. Barrington Brock, M.B.E., B.Sc., F.R.I.C. **26 October**

(*At Esso (Fawley) Recreation Club, Holbury*, 5 *p.m. for* 5.30 *p.m.*)

Problems with Aircraft Fuels. T. Maxwell-Smith **1 November**

IP LONDON BRANCH

(*At* 61 *New Cavendish Street, London, W.*1, 6.15 *p.m.—tea* 5.30 *p.m.*)

Realistic Management in a Marketing Company. *A. C. Durie* **18 October**

IP NORTHERN BRANCH

(*At the Old Nag's Head Hotel, Manchester*, 6.30 *p.m.*)

50 Years in the Oil Industry. George Sell, F.Inst.Pet. **17 October**

IP SOUTH EASTERN BRANCH

(*At Sun Hotel, Chatham*, 7.45 *p.m.*)

Channel Tunnel. M. A. Cameron. **7 November**

IP SOUTH WALES BRANCH

(*At Training Centre, BP Refinery (Llandarcy) Ltd*, 5.30 *p.m.*)

Looking for Oil Underwater. T. F. Gaskell, M.A. Ph.D., F.R.A.S. **26 October**

Instrumentation Automation in a Modern Oil Refinery. I. A. Barrett, B.A. (Cantab.) **3 November**

IP STANLOW BRANCH

(*At Lecture Theatre, Grosvenor Museum, Chester*, 7.30 *p.m.*)

The Use of Oil in the Steel Industry. R. Mayorcas, B.Sc. (Lond.), M.Inst. Fuel. **18 October**

IP YORKSHIRE BRANCH

(*At Great Northern Hotel, Leeds*, 7.30 *p.m.*)

Silicones. R. Nattrass. **11 October**

Industrial Petroleum Gases. K. R. Garrett. **8 November**

IP EXPLORATION AND PRODUCTION GROUP

(*At* 61 *New Cavendish Street, London, W.*1, 5.30 *p.m.—tea* 5 *p.m.*)

Joint Meeting with IP Economics and Operations Group. Economic Appraisal of Exploration and Production. D. O. R. Noble. **19 October**

DIESEL ENGINEERS AND USERS ASSOCIATION

(*At Institute of Marine Engineers*, 76 *Mark Lane, London, E.C.*3, 2.15 *p.m.*)

Symposium—Reclaiming Worn or Damaged Parts of Diesel Engines. **19 October**

THE SOCIETY OF INSTRUMENT TECHNOLOGY

(Manchester Section)

(*At Literary and Philosophical Society*, 36 *George Street, Manchester*, 1, 6.45 *p.m.*)

Instrumentation as an Aid to Fuel Efficiency. R. Clare, B.Sc., M.Inst.F. **9 October**

SITUATION VACANT

Graesser Salicylates Ltd., Chemical Manufacturers, Sandycroft, near Chester, require a **Development Engineer** with experience in Chemical plant erection, operation and maintenance. Applicants must hold an honours degree in Chemical Engineering or an equivalent qualification. Good prospects. The Company operates a non-contributory Pension Scheme. Please apply in writing to The Managing Director.

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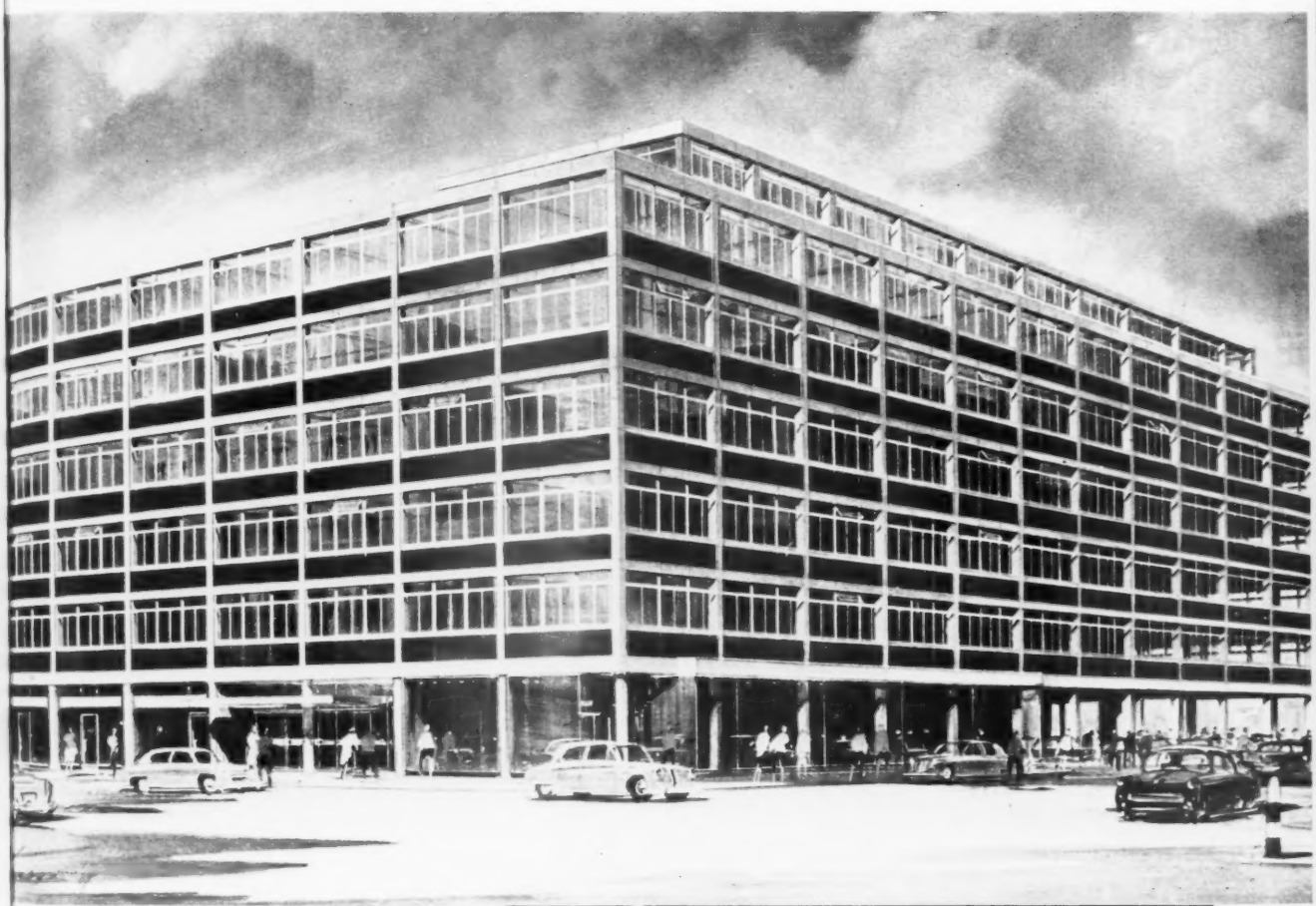

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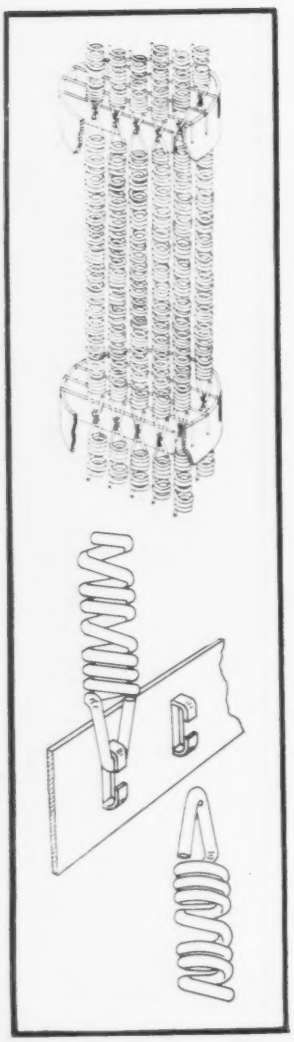

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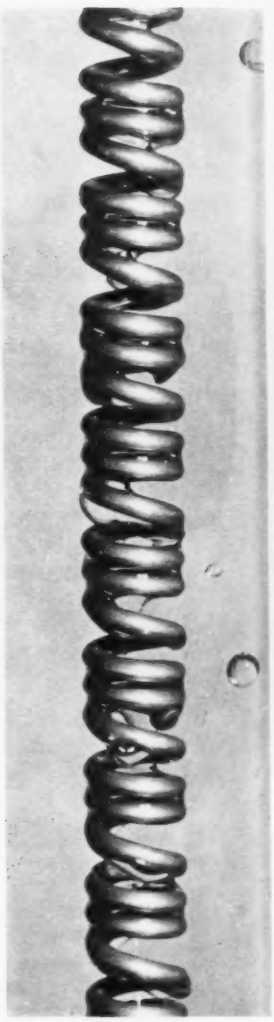

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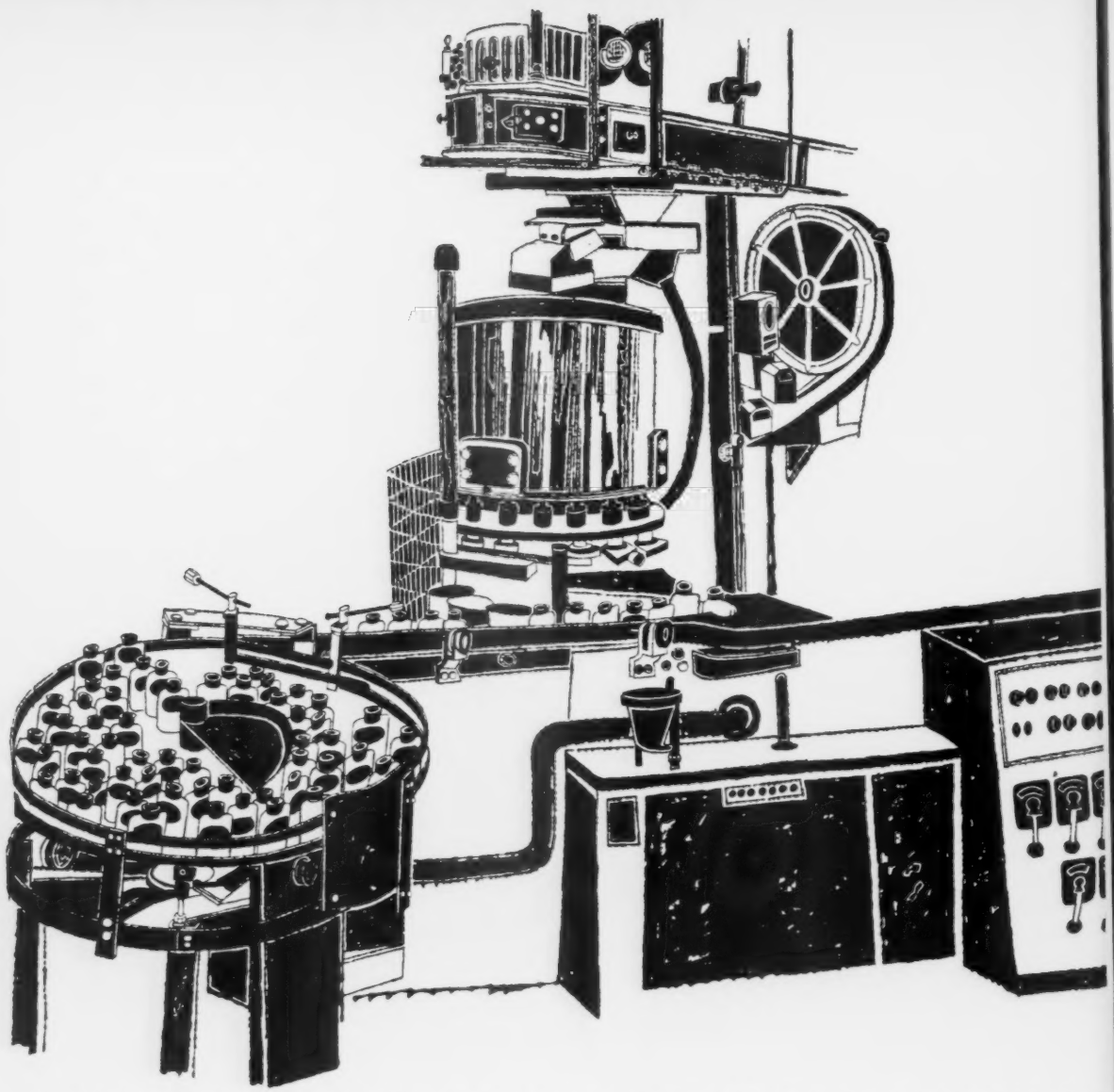

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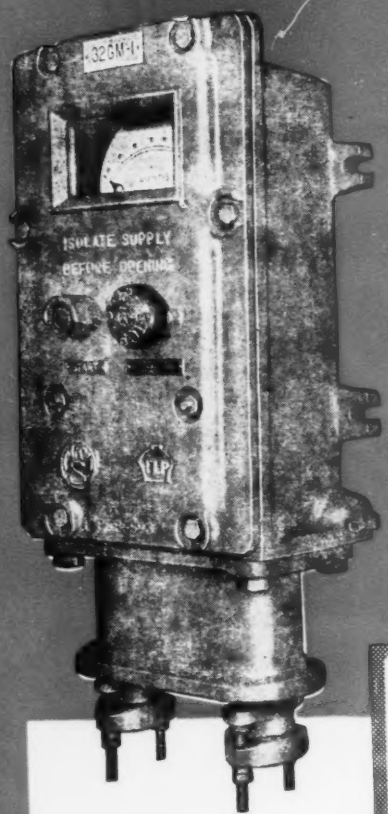

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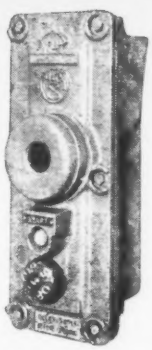

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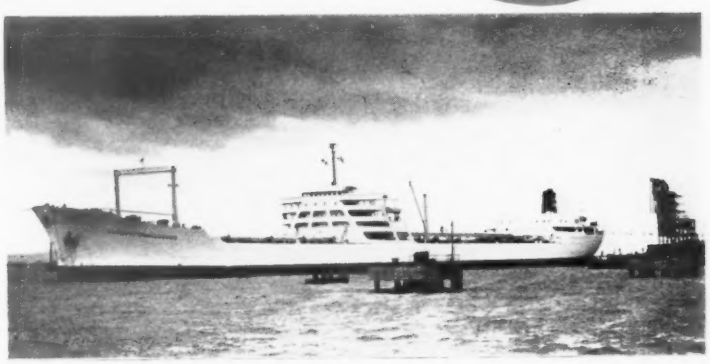

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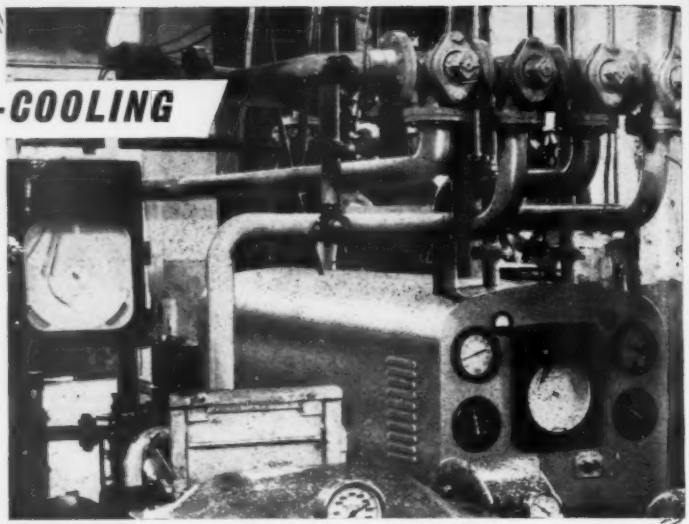

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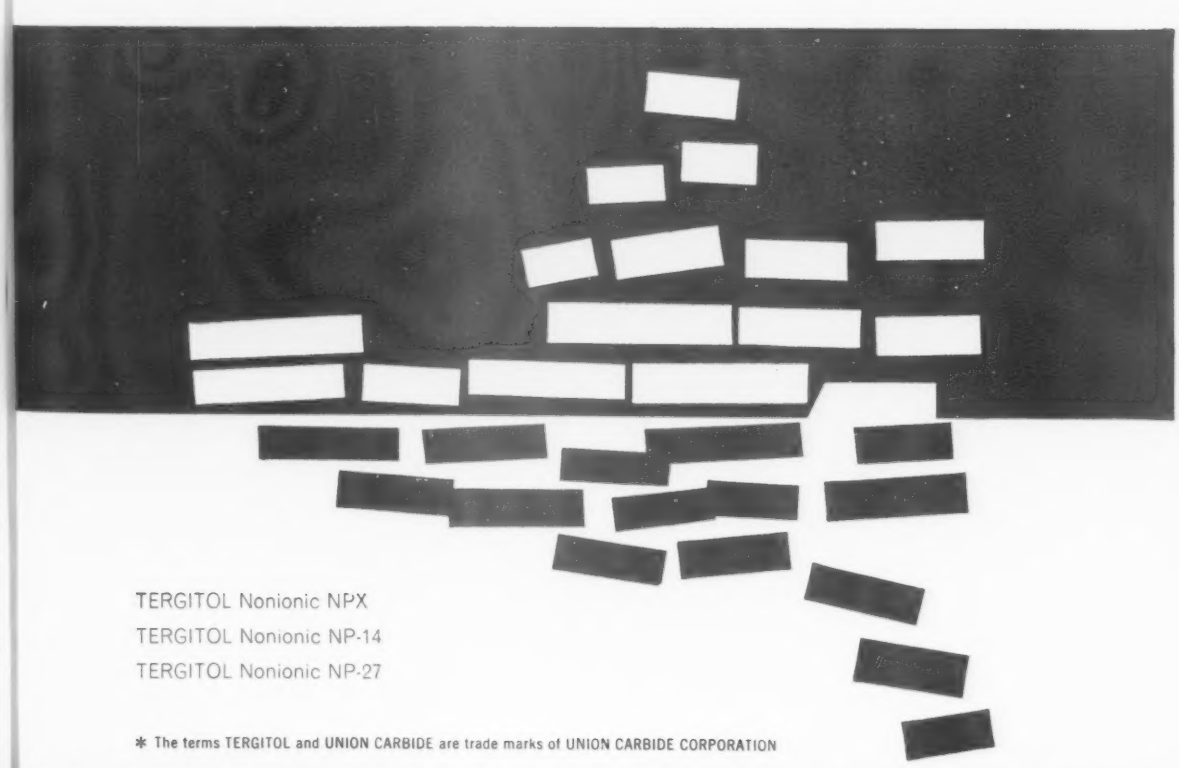

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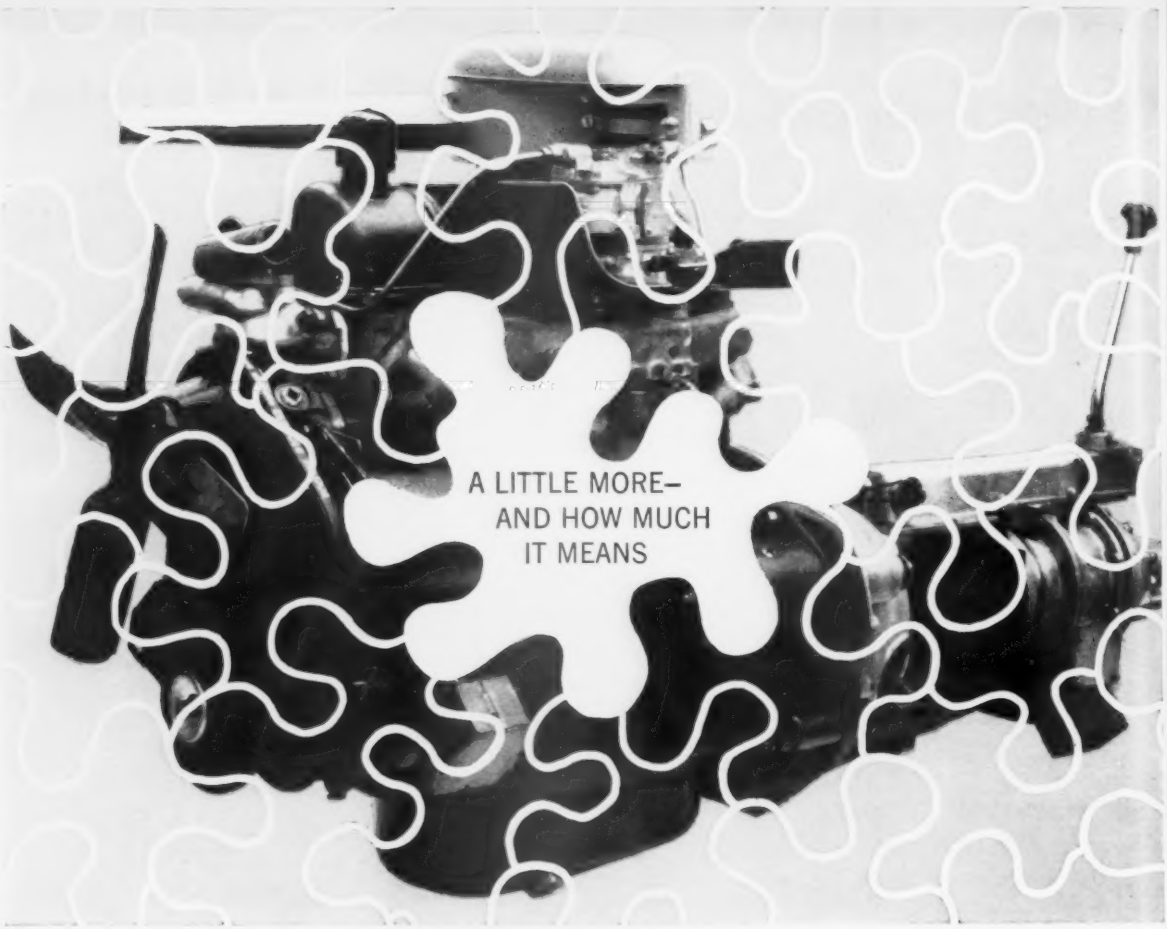

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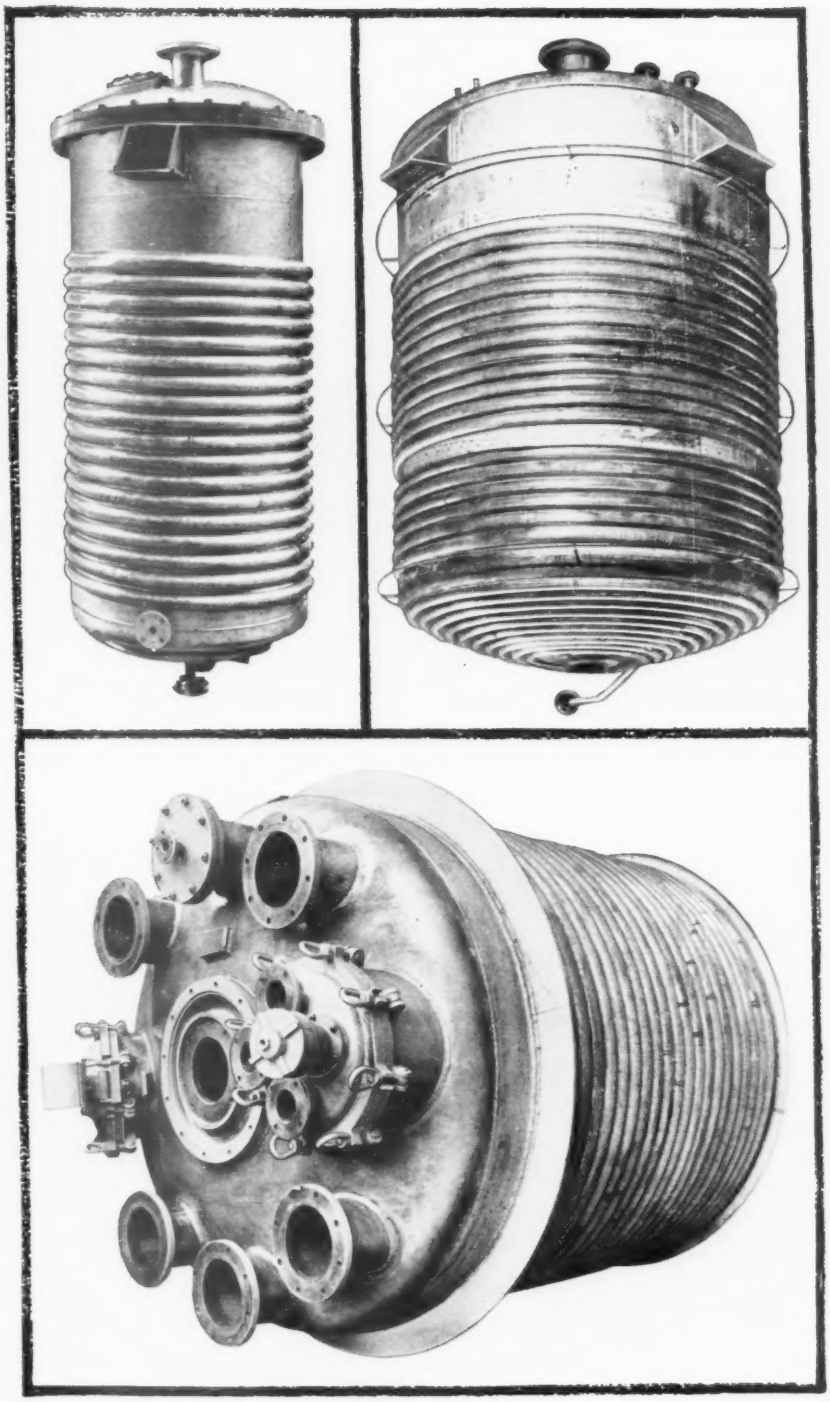

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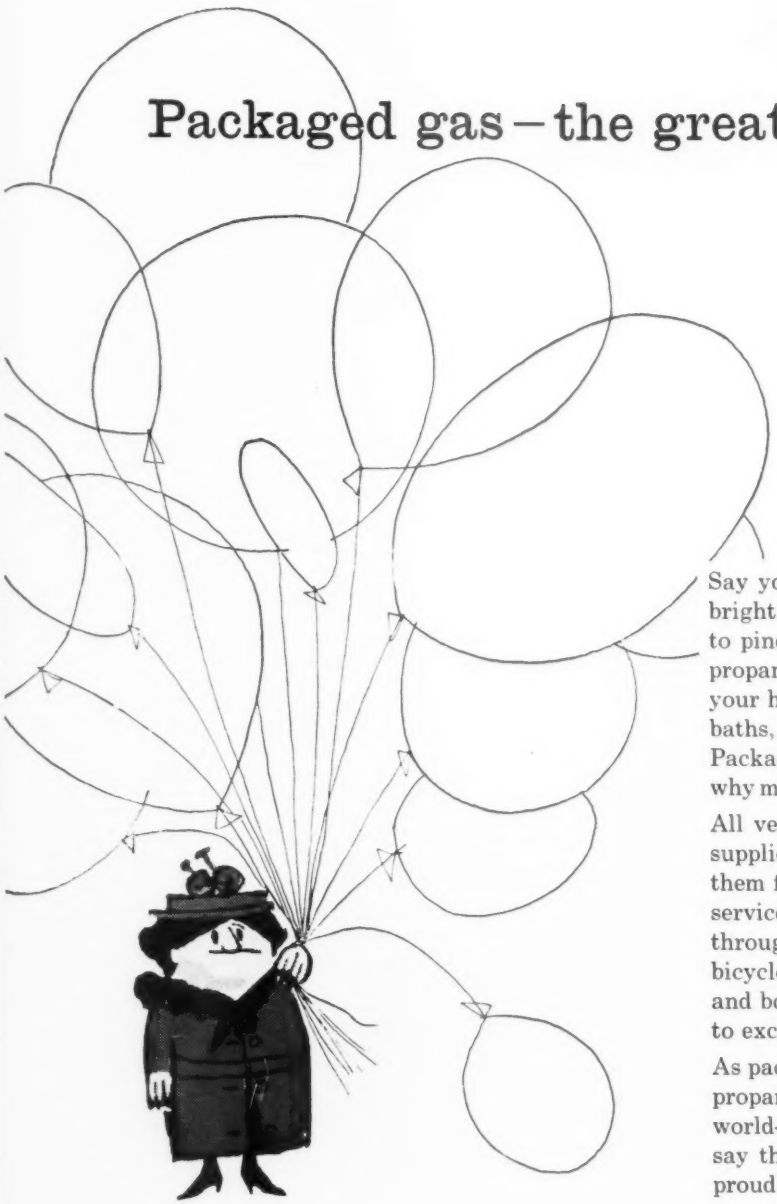

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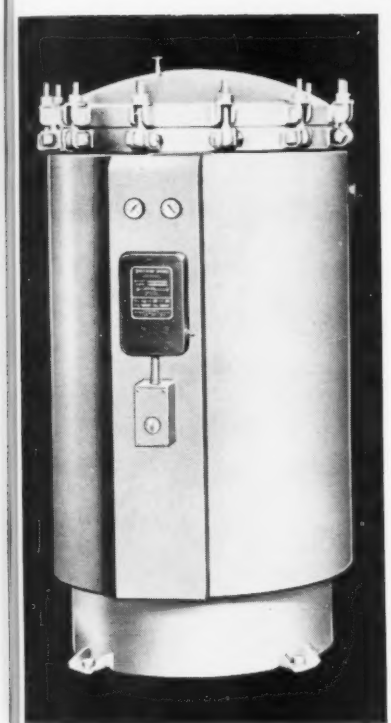

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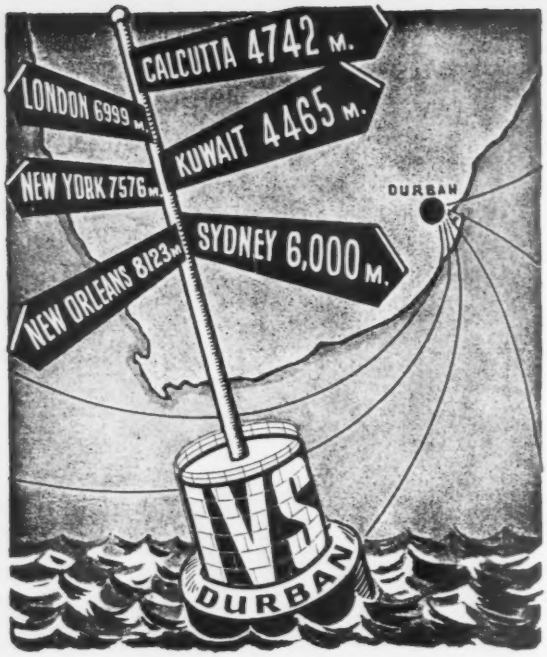

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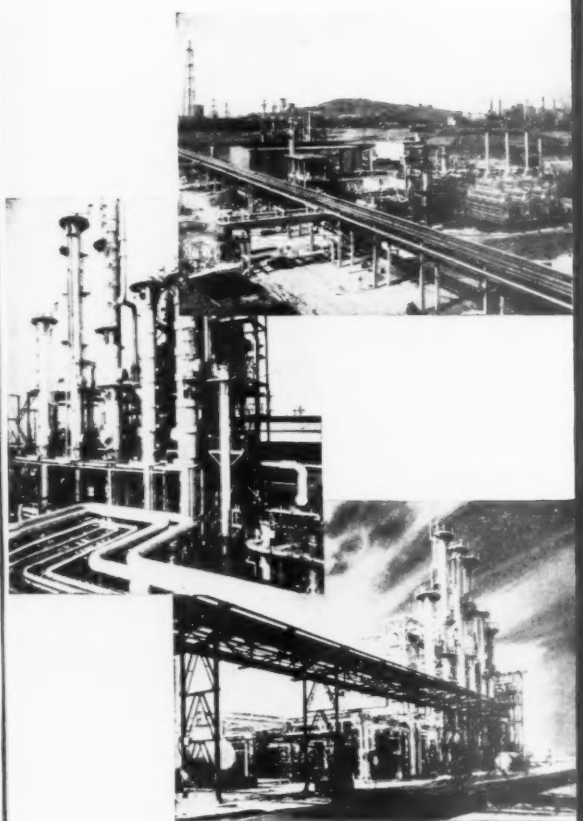

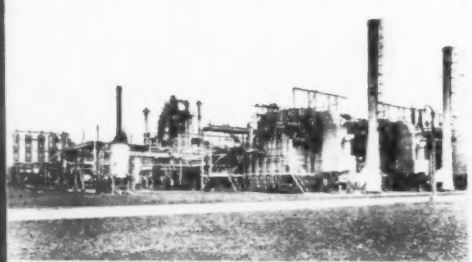

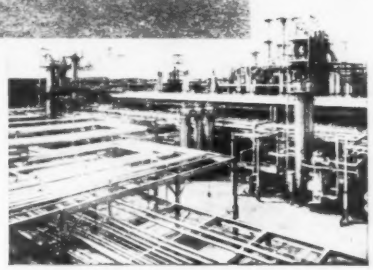

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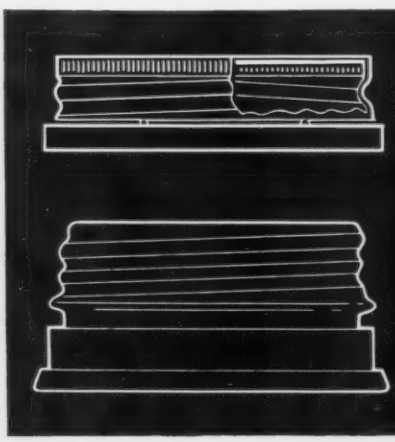

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